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# SECTION EC

# ENGINE CONTROL SYSTEM



## CONTENTS

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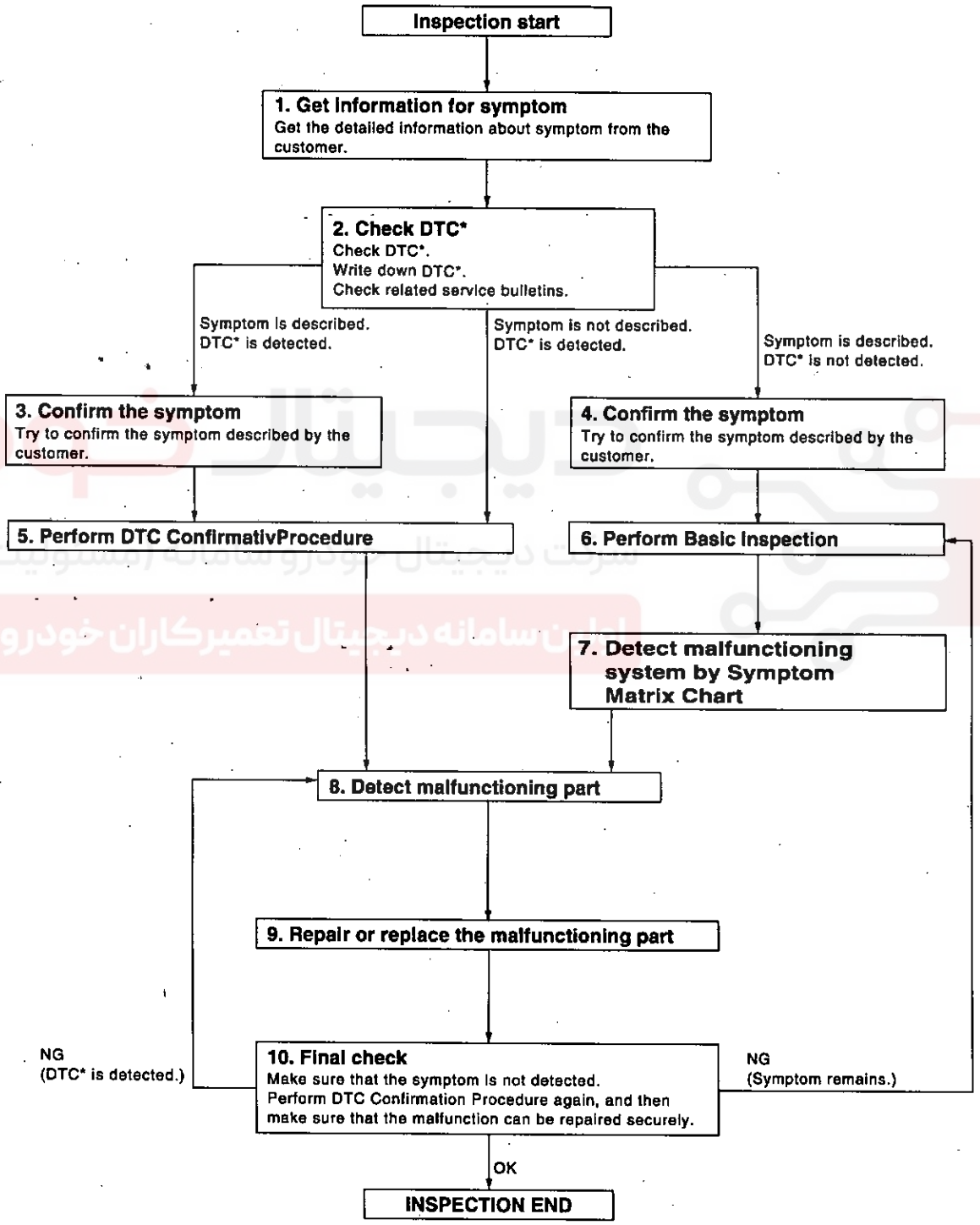
# BASIC INSPECTION

## DIAGNOSIS AND REPAIR WORK FLOW

### Work Flow

INFOID:0000000004899775

#### OVERALL SEQUENCE




*: Include 1st trip DTC.

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#### DETAILED FLOW

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## 1.GET INFORMATION FOR SYMPTOM

Get the detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurred) using the "Diagnostic Work Sheet". (Refer to EC-8, "Diagnostic Work Sheet".)

>> GO TO 2.

## 2.CHECK DTC

1. Check DTC.
2. Perform the following procedure if DTC is displayed.

- Record DTC and freeze frame data. (Print them out with GST.)
- Erase DTC. (Refer to EC-73, "Diagnosis Description".)
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to EC-276, "Symptom Table".)

3. Check related service bulletins for information.

Is any symptom described and is any DTC detected?

Symptom is described, DTC is detected>>GO TO 3.
Symptom is described, DTC is not detected>>GO TO 4.
Symptom is not described, DTC is detected>>GO TO 5.

## 3.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MIL ON).
Also study the normal operation and fail safe related to the symptom. Refer to EC-280, "Description" and EC-269, "Fail Safe".
Diagnostic Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

## 4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.
Also study the normal operation and fail safe related to the symptom. Refer to EC-280, "Description" and EC-269, "Fail Safe".
Diagnostic Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

## 5.PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then make sure that DTC is detected again.
If two or more DTCs are detected, refer to EC-271, "DTC Inspection Priority Chart" and determine trouble diagnosis order.

**NOTE:**

- Freeze frame data is useful if the DTC is not detected.
- Perform Component Function Check if DTC CONFIRMATION PROCEDURE is not included on Service Manual. This simplified check procedure is an effective alternative though DTC cannot be detected during this check.
  If the result of Component Function Check is NG, it is the same as the detection of DTC by DTC CONFIRMATION PROCEDURE.

Is DTC detected?

YES >> GO TO 10.
NO >> Check according to EC-272, "DTC Index".

## 6.PERFORM BASIC INSPECTION

Perform EC-10, "BASIC INSPECTION : Special Repair Requirement".

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>> GO TO 7.

## 7. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE

Detect malfunctioning system according to EC-276, "Symptom Table" based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptom.

>> GO TO 8.

## 8. DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE

Inspect according to Diagnosis Procedure of the system.

**NOTE:**

The Diagnosis Procedure in EC section described based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnosis Procedure. For details, refer to GI-40, "Circuit Inspection".

Is malfunctioning part detected?

YES >> GO TO 9.
NO >> Monitor input data from related sensors or check the voltage of related ECM terminals. Refer to EC-258, "Reference Value".

## 9. REPAIR OR REPLACE THE MALFUNCTIONING PART

1. Repair or replace the malfunctioning part.
2. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement.
3. Check DTC. If DTC is displayed, erase it. Refer to EC-73, "Diagnosis Description".

>> GO TO 10.

## 10. FINAL CHECK

When DTC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Component Function Check again, and then make sure that the malfunction have been repaired securely.
When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and make sure that the symptom is not detected.

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 8.
YES-2 >> Symptom remains: GO TO 6.
NO >> Before returning the vehicle to the customer, make sure to erase unnecessary DTC in ECM and TCM (Transmission Control Module). (Refer to EC-73, "Diagnosis Description".) If the completion of SRT is needed, drive vehicle under the specific DRIVING PATTERN in EC-274, "How to Set SRT Code".

# Diagnostic Work Sheet

INFOID:0000000004899770

## DESCRIPTION

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a incident. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the WORKSHEET SAMPLE below in order to organize all the information for troubleshooting.
Some conditions may cause the MIL to come on steady or blink and DTC to be detected. Examples:
Vehicle ran out of fuel, which caused the engine to misfire.

**KEY POINTS**

**WHAT** ..... Vehicle & engine model
**WHEN** ..... Date, Frequencies
**WHERE**..... Road conditions
**HOW** ..... Operating conditions, Weather conditions, Symptoms

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# DIAGNOSIS AND REPAIR WORK FLOW



## WORKSHEET SAMPLE

| | | | |
|---|---|---|---|
| Customer name MR/MS | | Model & Year | VIN |
| Engine # | | Trans. | Mileage |
| Incident Date | | Manuf. Date | In Service Date |
| Fuel and fuel filler cap | | ☐ Vehicle ran out of fuel causing misfire<br>☐ Fuel filler cap was left off or incorrectly screwed on. | |
| Symptoms | ☐ Startability | ☐ Impossible to start ☐ No combustion ☐ Partial combustion<br>☐ Partial combustion affected by throttle position<br>☐ Partial combustion NOT affected by throttle position<br>☐ Possible but hard to start ☐ Others [ ] | |
| | ☐ Idling | ☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle<br>☐ Others [ ] | |
| | ☐ Driveability | ☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power<br>☐ Intake backfire ☐ Exhaust backfire<br>☐ Others [ ] | |
| | ☐ Engine stall | ☐ At the time of start ☐ While idling<br>☐ While accelerating ☐ While decelerating<br>☐ Just after stopping ☐ While loading | |
| Incident occurrence | | ☐ Just after delivery ☐ Recently<br>☐ In the morning ☐ At night ☐ In the daytime | |
| Frequency | | ☐ All the time ☐ Under certain conditions ☐ Sometimes | |
| Weather conditions | | ☐ Not affected | |
| | Weather | ☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ] | |
| | Temperature | ☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F | |
| Engine conditions | | ☐ Cold ☐ During warm-up ☐ After warm-up<br>Engine speed 0 2,000 4,000 6,000 8,000 rpm | |
| Road conditions | | ☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down) | |
| Driving conditions | | ☐ Not affected<br>☐ At starting ☐ While idling ☐ At racing<br>☐ While accelerating ☐ While cruising<br>☐ While decelerating ☐ While turning (RH/LH)<br>Vehicle speed 0 10 20 30 40 50 60 MPH | |
| Malfunction indicator lamp | | ☐ Turned on ☐ Not turned on | |

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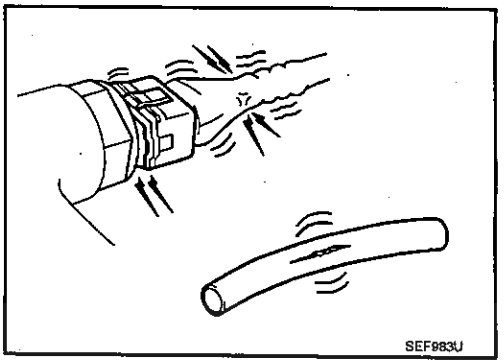
# INSPECTION AND ADJUSTMENT
## BASIC INSPECTION
## BASIC INSPECTION : Special Repair Requirement

INFOID:0000000004899777

### 1.INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket
3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.
4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
Ensure engine stays below 1,000 rpm.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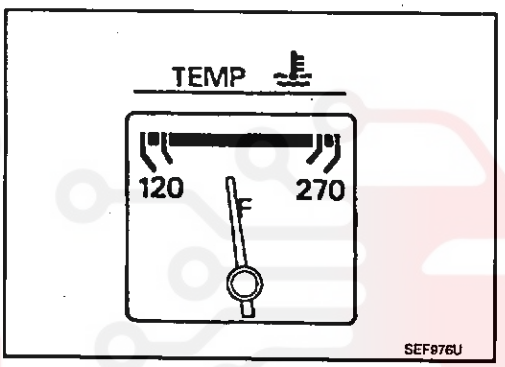

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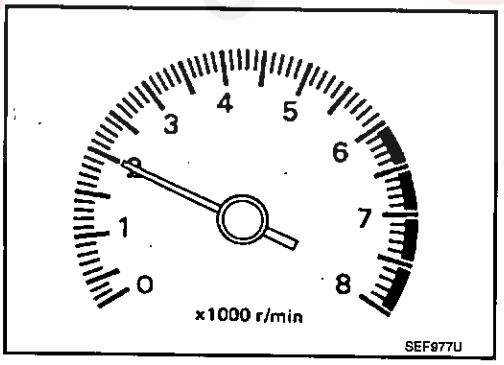
5. Run engine at about 2,000 rpm for about 2 minutes under no load.
6. Make sure that no DTC is displayed with GST.

Is any DTC detected?

YES >> GO TO 2.
NO >> GO TO 3.



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### 2.REPAIR OR REPLACE

Repair or replace components as necessary according to corresponding Diagnostic Procedure.

>> GO TO 3.

### 3.CHECK TARGET IDLE SPEED

1. Run engine at about 2,000 rpm for about 2 minutes under no load.



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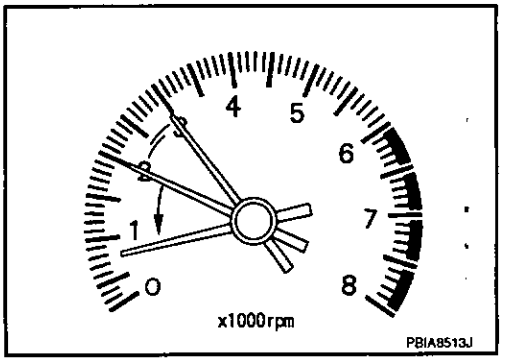
2. Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.
3. Check idle speed.
   For procedure, refer to EC-14, "IDLE SPEED : Special Repair Requirement".
   For specification, refer to EC-290, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 4.




## 4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-14, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 5.

## 5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 6.

## 6. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 7.
NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.

## 7. CHECK TARGET IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to EC-14, "IDLE SPEED : Special Repair Requirement".
   For specification, refer to EC-290, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 8.

## 8. DETECT MALFUNCTIONING PART

Check the Following.
- Check camshaft position sensor (PHASE) and circuit. Refer to EC-151, "DTC Logic".
- Check crankshaft position sensor (POS) and circuit. Refer to EC-147, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace. Then GO TO 4

## 9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
2. Perform initialization of NATS system and registration of all NATS ignition key IDs.

>> GO TO 4.

## 10. CHECK IGNITION TIMING

1. Run engine at idle.





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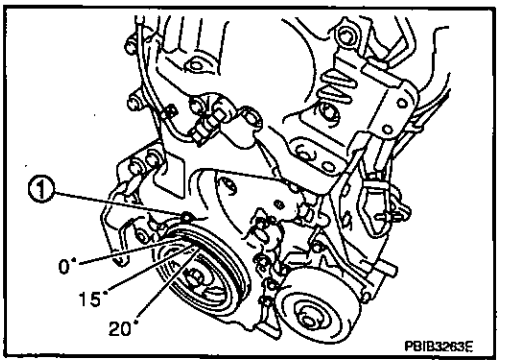
2. Check ignition timing with a timing light.
For procedure, refer to EC-14, "IGNITION TIMING : Special Repair Requirement".
For specification, refer to EC-290, "Ignition Timing".




1 : Timing indicator

Is the inspection result normal?

YES >> GO TO 19.
NO >> GO TO 11.

## 11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-14, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 12.

## 12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 13.

## 13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 14.
NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.

## 14. CHECK TARGET IDLE SPEED AGAIN

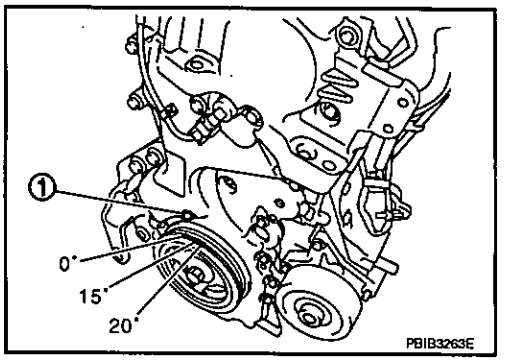
1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
For procedure, refer to EC-14, "IDLE SPEED : Special Repair Requirement".
For specification, refer to EC-290, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 15.
NO >> GO TO 17.

## 15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.
For procedure, refer to EC-14, "IGNITION TIMING : Special Repair Requirement".
For specification, refer to EC-290, "Ignition Timing".




1 : Timing indicator

Is the inspection result normal?

YES >> GO TO 19.
NO >> GO TO 16.

## 16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-165, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 17.
NO >> Repair the timing chain installation. Then GO TO 4.



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## 17.DETECT MALFUNCTIONING PART

Check the following.
- Check camshaft position sensor (PHASE) and circuit. Refer to EC-151, "DTC Logic".
- Check crankshaft position sensor (POS) and circuit. Refer to EC-147, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 18.
NO >> Repair or replace. Then GO TO 4

## 18.CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
2. Perform initialization of NATS system and registration of all NATS ignition key IDs.

>> GO TO 4.

## 19.INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, go to EC-13, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

# ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT

## ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Description

INFOID:0000000004899778

When replacing ECM, this procedure must be performed.

## ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement

INFOID:0000000004899779

### 1.PERFORM INITIALIZATION OF NATS SYSTEM AND REGISTRATION OF ALL NATS IGNITION KEY IDS

Refer to SEC-7, "System Diagram".

>> GO TO 2.

### 2.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-14, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

### 3.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 4.

### 4.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

# IDLE SPEED

## IDLE SPEED : Description

INFOID:0000000004899780

This describes how to check the idle speed. For the actual procedure, follow the instructions in "BASIC INSPECTION".

## IDLE SPEED : Special Repair Requirement

INFOID:0000000004899781

### 1.CHECK IDLE SPEED

**With GST**
Check idle speed with Service $01 of GST.

>> INSPECTION END

## IGNITION TIMING

### IGNITION TIMING : Description

INFOID:0000000004899782

This describes how to check the ignition timing. For the actual procedure, follow the instructions in "BASIC INSPECTION".

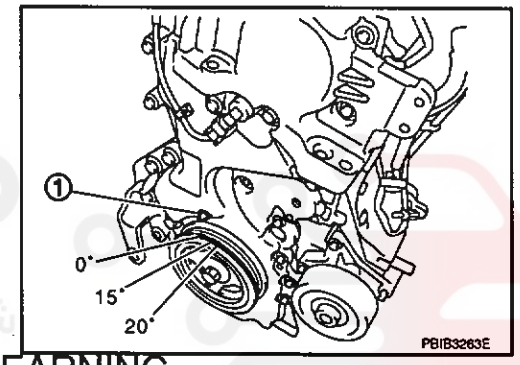
### IGNITION TIMING : Special Repair Requirement

INFOID:0000000004899783

### 1.CHECK IGNITION TIMING

1. Attach timing light to the ignition coil No.4 harness.
2. Check ignition timing.

1 : Timing indicator




>> INSPECTION END

## ACCELERATOR PEDAL RELEASED POSITION LEARNING

### ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description

INFOID:0000000004899784

Accelerator Pedal Released Position Learning is a function of ECM to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

### ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement

INFOID:0000000004899785

### 1.START

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch ON and wait at least 2 seconds.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON and wait at least 2 seconds.
5. Turn ignition switch OFF and wait at least 10 seconds.

>> END

## THROTTLE VALVE CLOSED POSITION LEARNING

### THROTTLE VALVE CLOSED POSITION LEARNING : Description

INFOID:0000000004899786

Throttle Valve Closed Position Learning is a function of ECM to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

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## THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement

INFOID:0000000004899787

### 1.START

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

>> END

## IDLE AIR VOLUME LEARNING

## IDLE AIR VOLUME LEARNING : Description

INFOID:0000000004899788

Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps each engine idle speed within the specific range. It must be performed under any of the following conditions:
- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

## IDLE AIR VOLUME LEARNING : Special Repair Requirement

INFOID:0000000004899789

### 1.PRECONDITIONING

Make sure that all of the following conditions are satisfied.
Learning will be cancelled if any of the following conditions are missed for even a moment.
- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 100°C (158 - 212°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
- **For vehicles equipped with daytime light systems, perform one of the following procedures before starting engine not to illuminate headlamps.**
- Apply parking brake
- Set lighting switch to the 1st position
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
- CVT models
- Drive vehicle for 10 minutes.

>> GO TO 2.

### 2.IDLE AIR VOLUME LEARNING

**NOTE:**
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform Accelerator Pedal Released Position Learning. Refer to EC-14, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".
2. Perform Throttle Valve Closed Position Learning. Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
3. Start engine and warm it up to normal operating temperature.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
6. Repeat the following procedure quickly five times within 5 seconds.
   - Fully depress the accelerator pedal.
   - Fully release the accelerator pedal.
7. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MIL stops blinking and turned ON.
8. Fully release the accelerator pedal within 3 seconds after the MIL turned ON.



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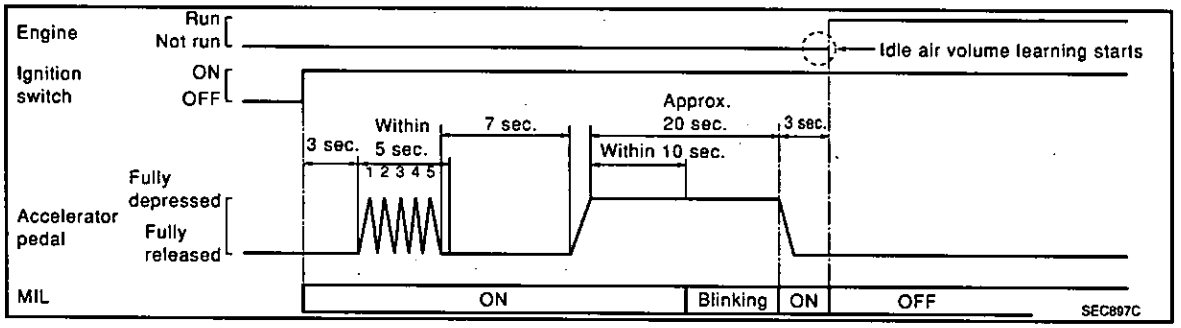
9. Start engine and let it idle.
10. Wait 20 seconds.




>> GO TO 3.

## 3.CHECK IDLE SPEED AND IGNITION TIMING

Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications. For specification, refer to EC-290, "Idle Speed" and EC-290, "Ignition Timing".

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

## 4.DETECT MALFUNCTIONING PART

Check the following
- Check that throttle valve is fully closed.
- Check PCV valve operation.
- Check that downstream of throttle valve is free from air leakage.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

## 5.DETECT MALFUNCTIONING PART

Engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.
If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning all over again:
- Engine stalls.
- Erroneous idle.

>> INSPECTION END

# MIXTURE RATIO SELF-LEARNING VALUE CLEAR

## MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description

INFOID:0000000004899790

This describes how to erase the mixture ratio self-learning value. For the actual procedure, follow the instructions in "Diagnosis Procedure".

## MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement

INFOID:0000000004899791

## 1.START

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor harness connector.
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Check DTC. Make sure DTC P0102 is detected.
7. Erase the DTC P0102.

>> END

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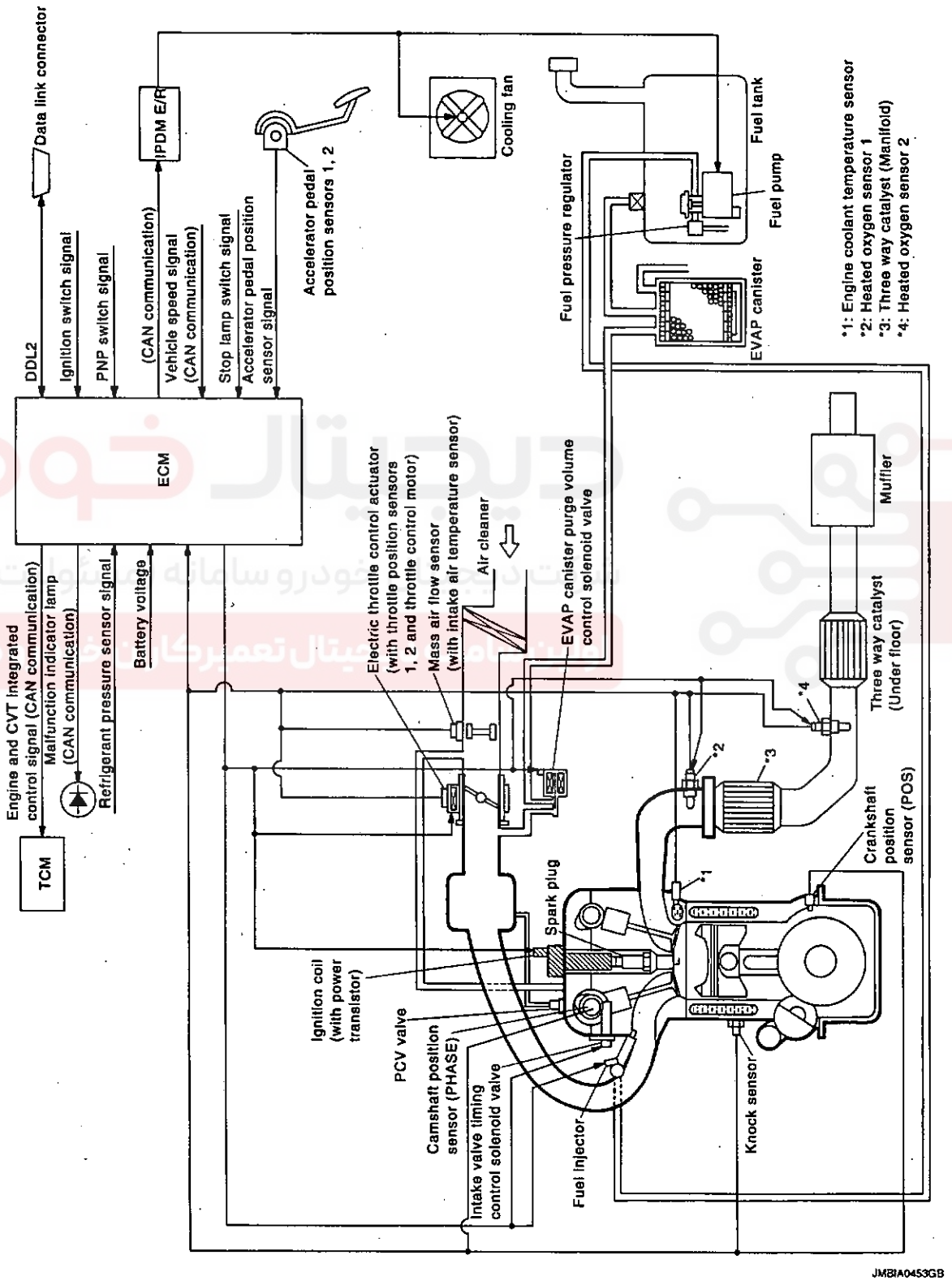
# FUNCTION DIAGNOSIS

## ENGINE CONTROL SYSTEM

### System Diagram

INFOID:0000000004899792



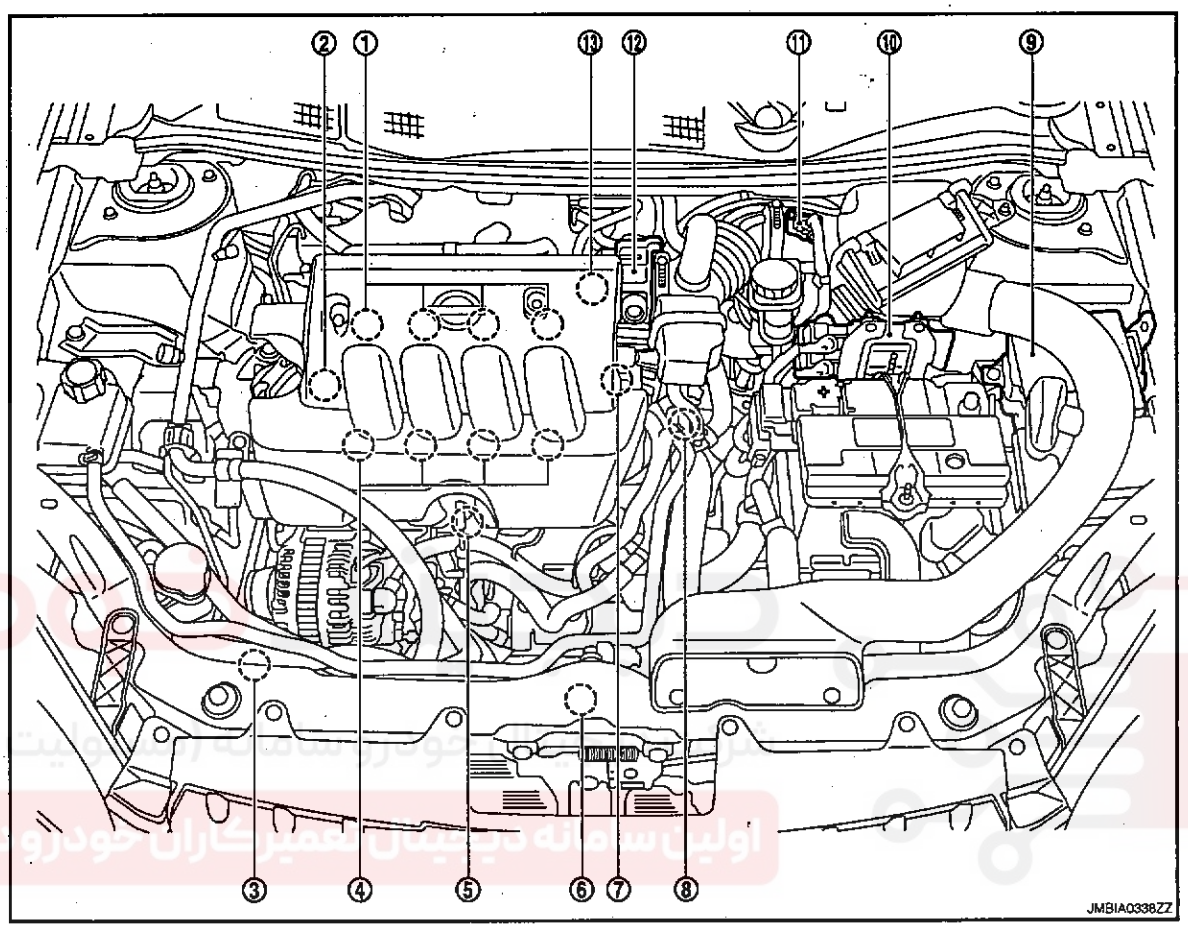
## System Description

INFOID:0000000004899793

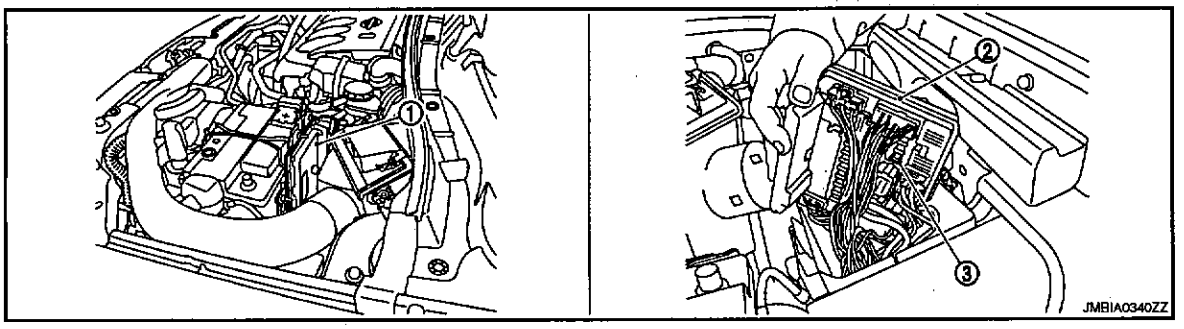
ECM performs various controls such as fuel injection control and ignition timing control.

## Component Parts Location

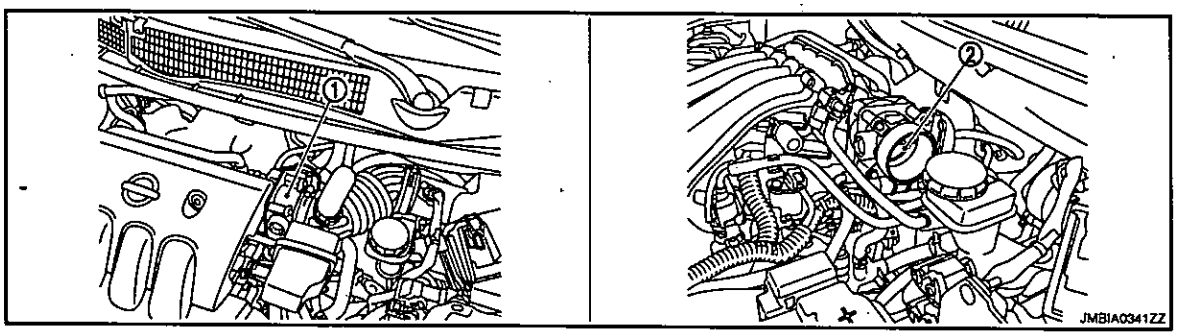
INFOID:0000000004899794



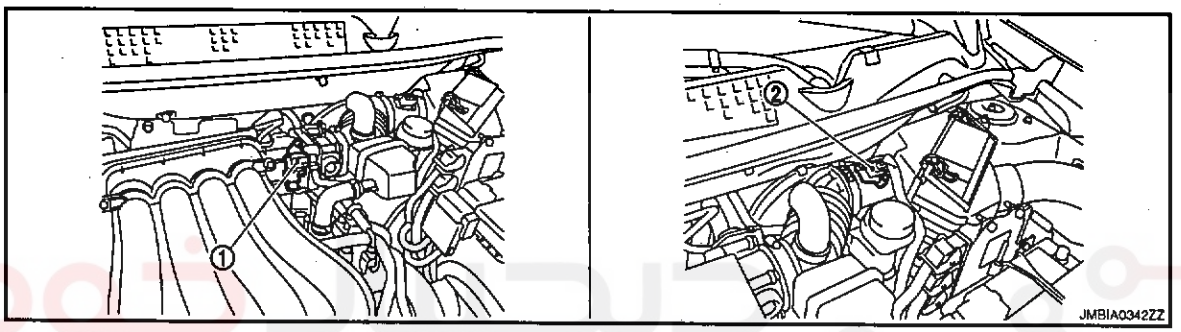

1. Ignition coil (with power transistor) and spark plug
2. PCV valve
3. Refrigerant pressure sensor
4. Fuel injector
5. Knock sensor
6. Cooling fan motor
7. Camshaft position sensor (PHASE)
8. Engine coolant temperature sensor
9. IPDM E/R
10. ECM
11. Mass air flow sensor (with intake air temperature sensor)
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



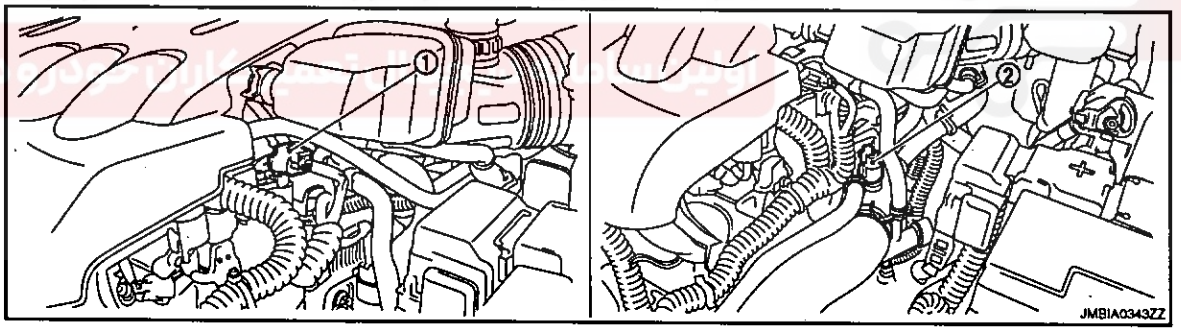

1. ECM
2. IPDM E/R
3. Fuel pump fuse (15A)



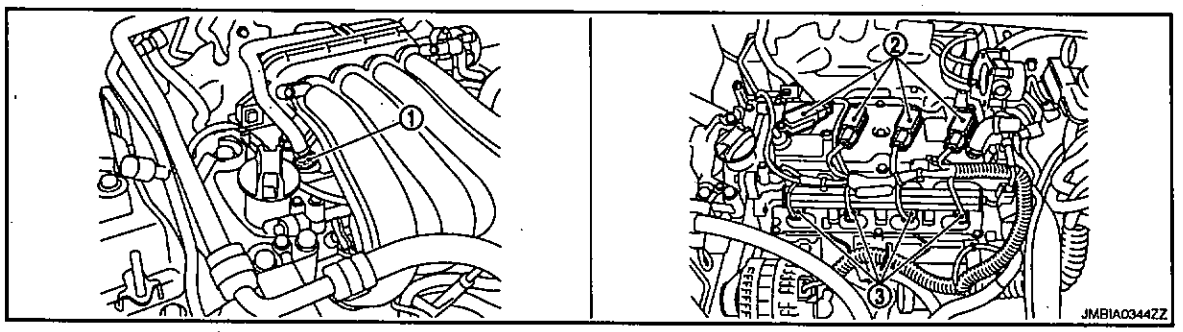

1. Electric throttle control actuator (with built-in position sensor, throttle control motor)
2. Throttle valve



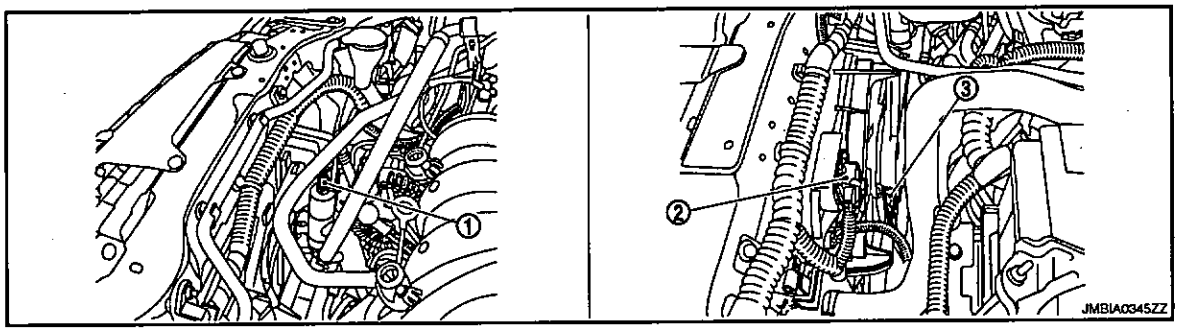

1. EVAP canister purge volume control solenoid valve
2. Mass air flow sensor (with intake air temperature sensor)



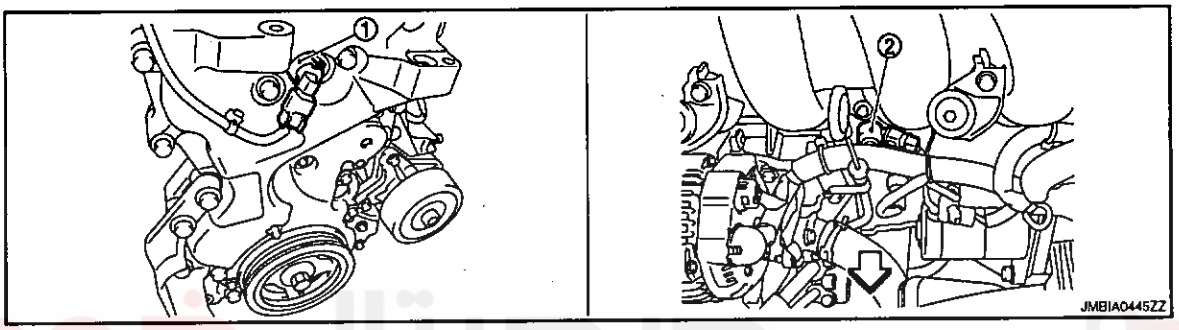

1. Camshaft position sensor (PHASE)
2. Engine coolant temperature sensor




1. PCV valve
2. Ignition coil (with power transistor) and spark plug
3. Fuel injector

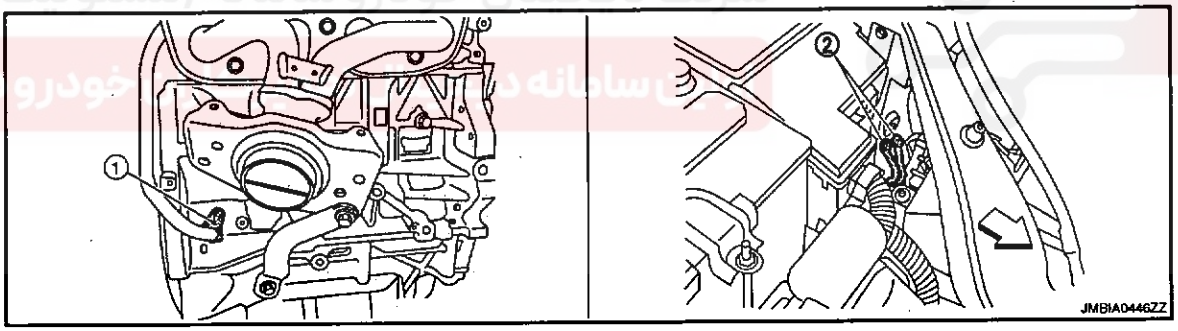



1. Refrigerant pressure sensor 2. Resister 3. Cooling fan motor



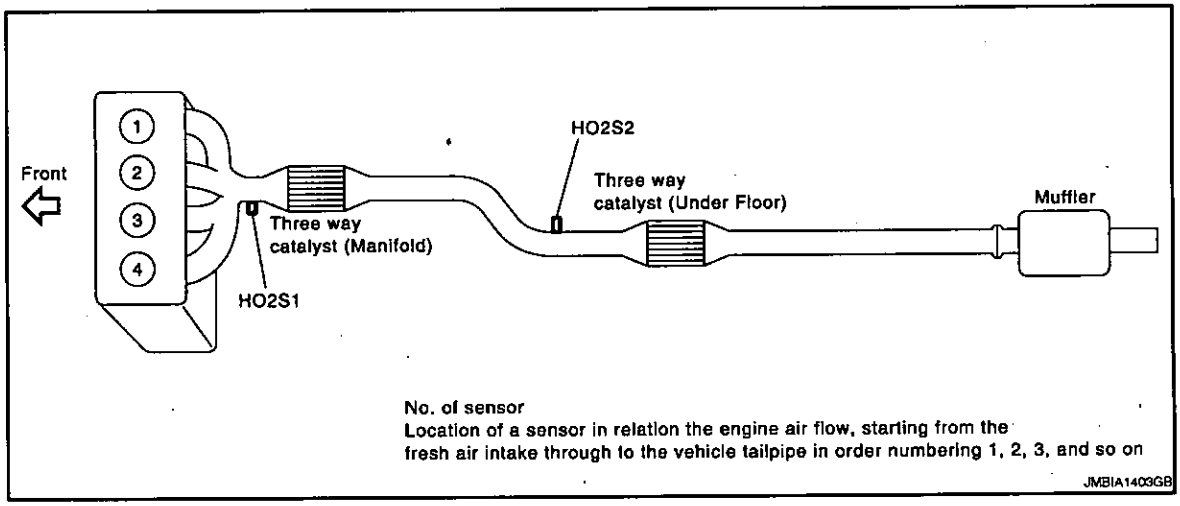

1. Intake valve timing control solenoid valve 2. Knock sensor

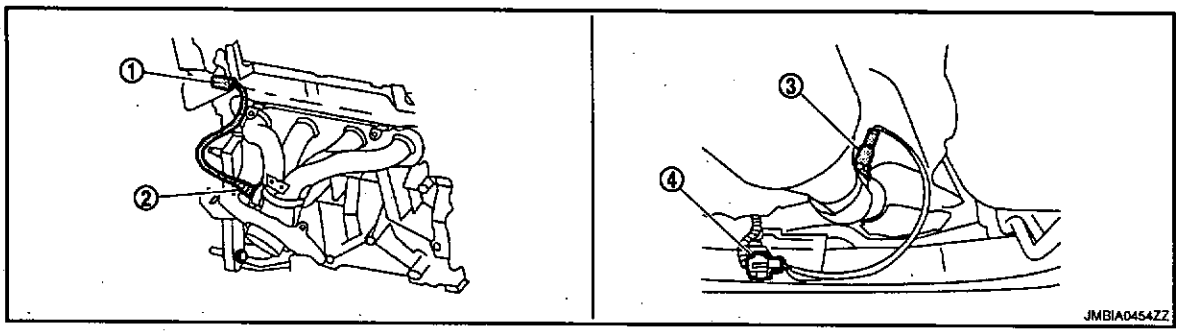
⇦ : Vehicle front



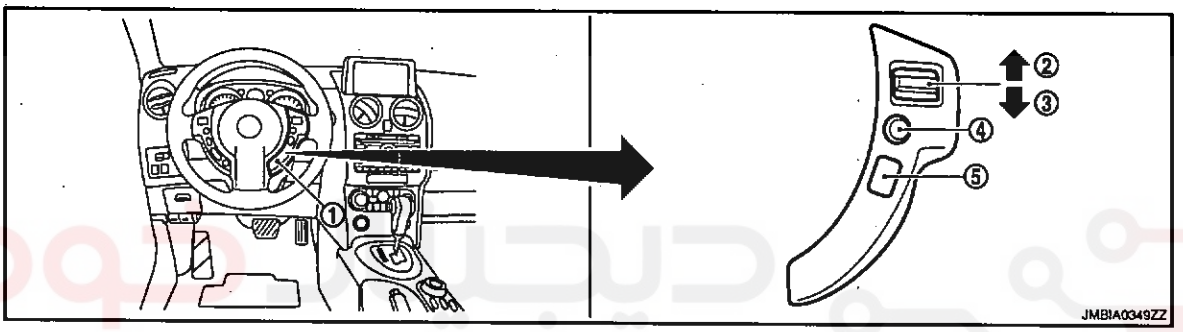

1. Crankshaft position sensor (POS) 2. Ground

⇦ : Vehicle front

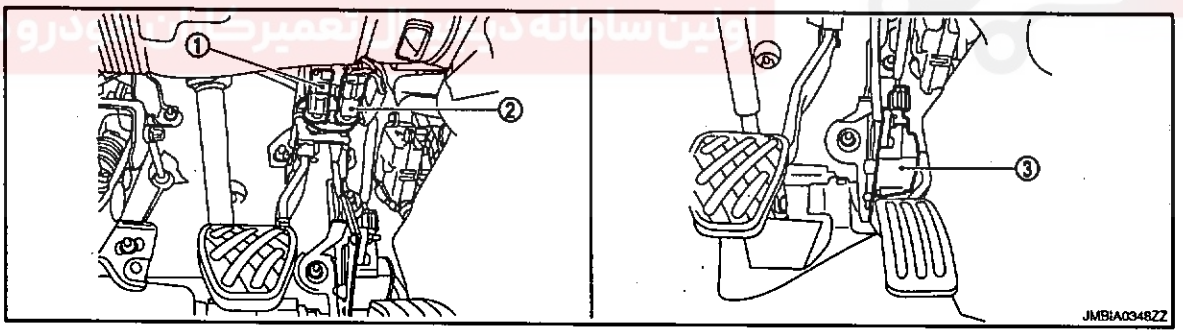




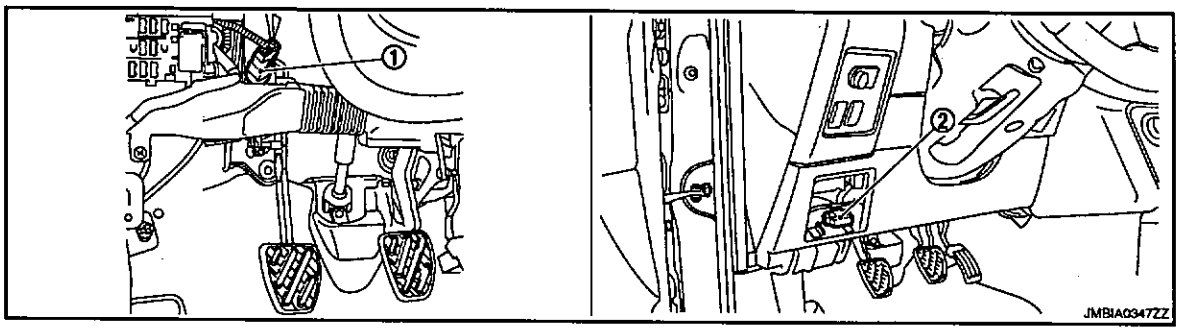

1. Heated oxygen sensor 1 harness connector
2. Heated oxygen sensor 1
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector



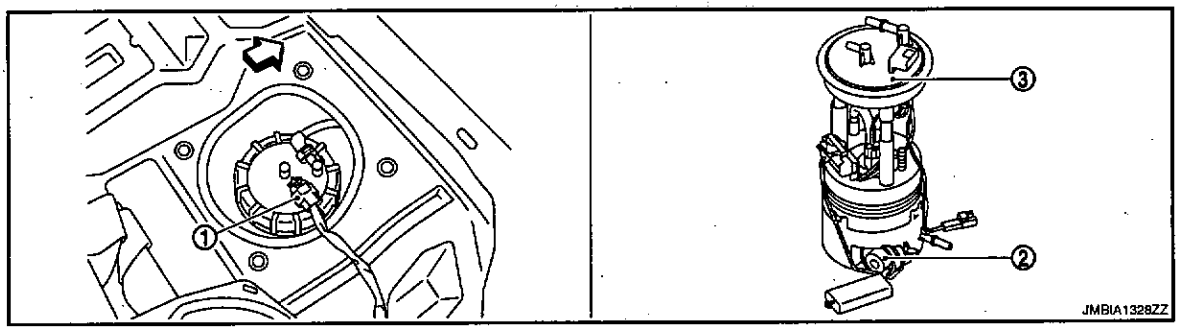

1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCCELERATE switch
4. SET/COAST switch
5. MAIN switch




1. Stop lamp switch
2. ASCD brake switch
3. Accelerator pedal position sensor




1. ASCD clutch switch
2. Data link connector




1. Fuel level sensor unit and fuel pump harness connector
2. Fuel pressure regulator
3. Fuel level sensor unit and fuel pump

⇦ : Vehicle front

## Component Description

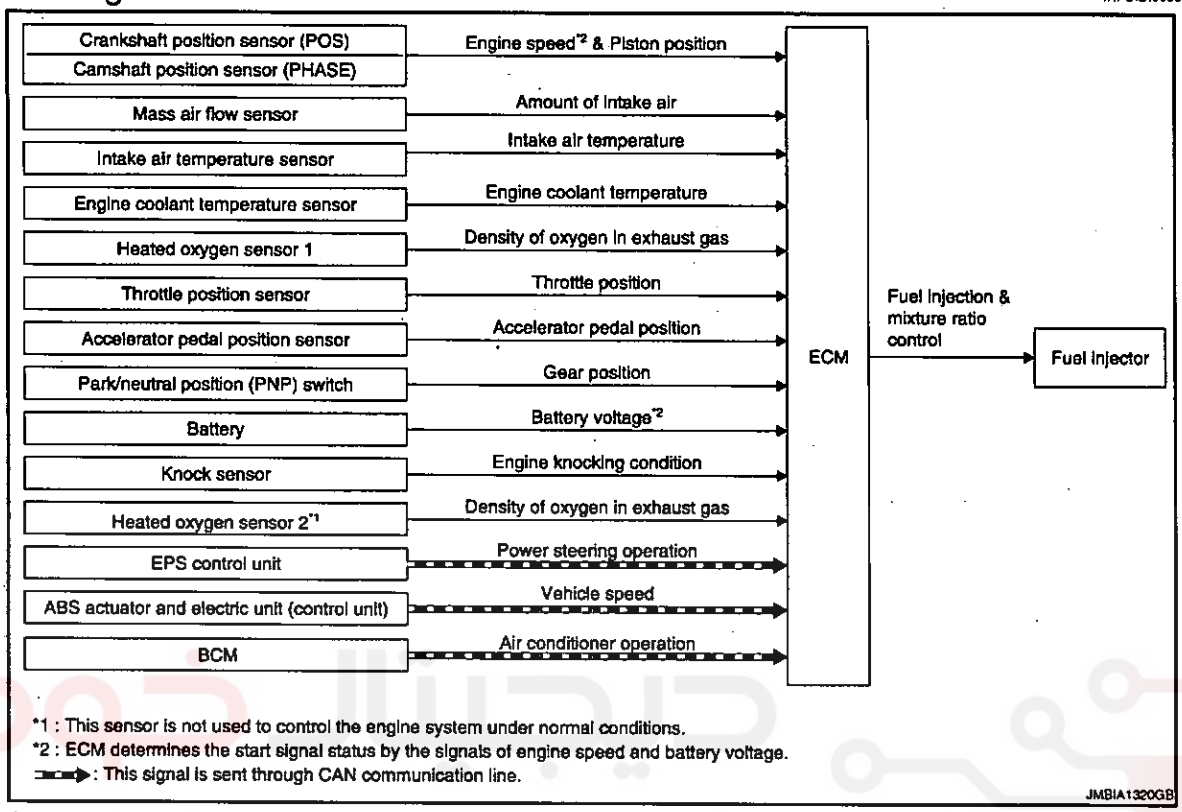
INFOID:0000000004899795

| Component | Reference |
|---|---|
| Accelerator pedal position sensor | EC-221, "Description" |
| ASCD brake switch | EC-207, "Description" |
| ASCD steering switch | EC-204, "Description" |
| ASCD vehicle speed sensor | EC-213, "Description" |
| Camshaft position sensor (PHASE) | EC-151, "Description" |
| Crankshaft position sensor (POS) | EC-147, "Description" |
| Cooling fan motor | EC-240, "Description" |
| Electric throttle control actuator | EC-167, "Description" |
| Engine coolant temperature sensor | EC-99, "Description" |
| EVAP canister purge volume control solenoid valve | EC-159, "Description" |
| Fuel injector | EC-244, "Description" |
| Fuel pump | EC-246, "Description" |
| Heated oxygen sensor 1 | EC-105, "Description" |
| Heated oxygen sensor 1 heater | EC-115, "Description" |
| Heated oxygen sensor 2 | EC-118, "Description" |
| Heated oxygen sensor 2 heater | EC-126, "Description" |
| Ignition coil (with power transistor) | EC-249, "Description" |
| Intake air temperature sensor | EC-96, "Description" |
| Intake valve timing control solenoid valve | EC-164, "Description" |
| Knock sensor | EC-145, "Description" |
| Mass air flow sensor | EC-92, "Description" |
| Park/neutral position (PNP) switch | EC-215, "Description" |
| PCV valve | EC-255, "Description" |
| Refrigerant pressure sensor | EC-256, "Description" |
| Stop lamp switch | EC-218, "Description" |
| Throttle control motor | EC-176, "Description" |
| Throttle control motor relay | EC-173, "Description" |
| Throttle position sensor | EC-102, "Description" |

# MULTIPORT FUEL INJECTION SYSTEM

## System Diagram

INFOID:0000000004899796




## System Description

INFOID:0000000004899797

### INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Crankshaft position sensor (POS) | Engine speed*3<br>Piston position | Fuel injection & mixture ratio control | Fuel injector |
| Camshaft position sensor (PHASE) | | | |
| Mass air flow sensor | Amount of intake air | | |
| Intake air temperature sensor | Intake air temperature | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Heated oxygen sensor 1 | Density of oxygen in exhaust gas | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Park/neutral position (PNP) switch | Gear position | | |
| Battery | Battery voltage*3 | | |
| Knock sensor | Engine knocking condition | | |
| Heated oxygen sensor 2*1 | Density of oxygen in exhaust gas | | |
| EPS control unit | Power steering operation*2 | | |
| ABS actuator and electric unit (control unit) | Vehicle speed*2 | | |
| BCM | Air conditioner operation*2 | | |

*1: This sensor is not used to control the engine system under normal conditions.
*2: This signal is sent to the ECM through CAN communication line.
*3: ECM determines the start signal status by the signals of engine speed and battery voltage.

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## SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from the crankshaft position sensor (POS), camshaft position sensor (PHASE) and the mass air flow sensor.

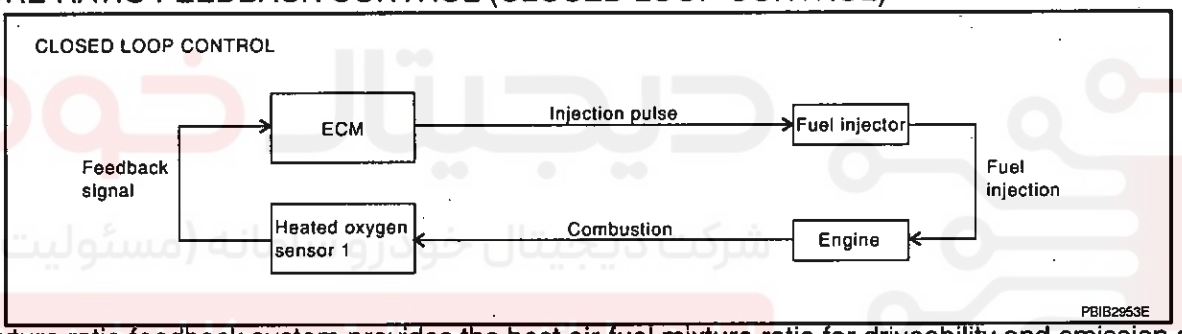
## VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

<Fuel increase>
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from N to D (CVT models)
- High-load, high-speed operation

<Fuel decrease>
- During deceleration
- During high engine speed operation

## MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)




The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to EC-105, "Description". This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

- Open Loop Control
  The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from N to D (CVT models)
- When starting the engine

## MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., fuel injector clogging) directly affect mixture ratio.

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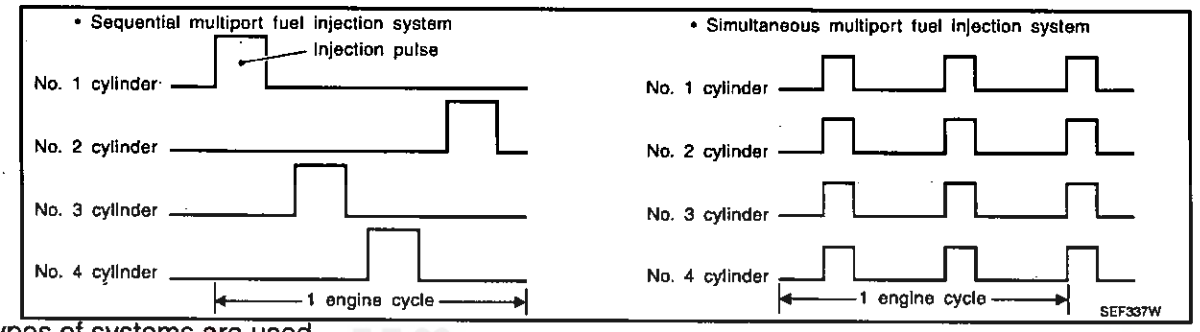
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.
"Fuel trim" refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
"Short term fuel trim" is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
"Long term fuel trim" is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

## FUEL INJECTION TIMING




Two types of systems are used.

- Sequential Multiport Fuel Injection System
  Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.
- Simultaneous Multiport Fuel Injection System
  Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
  The four injectors will then receive the signals two times for each engine cycle.
  This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

## FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration, operation of the engine at excessively high speeds or operation of the vehicle at excessively high speeds.





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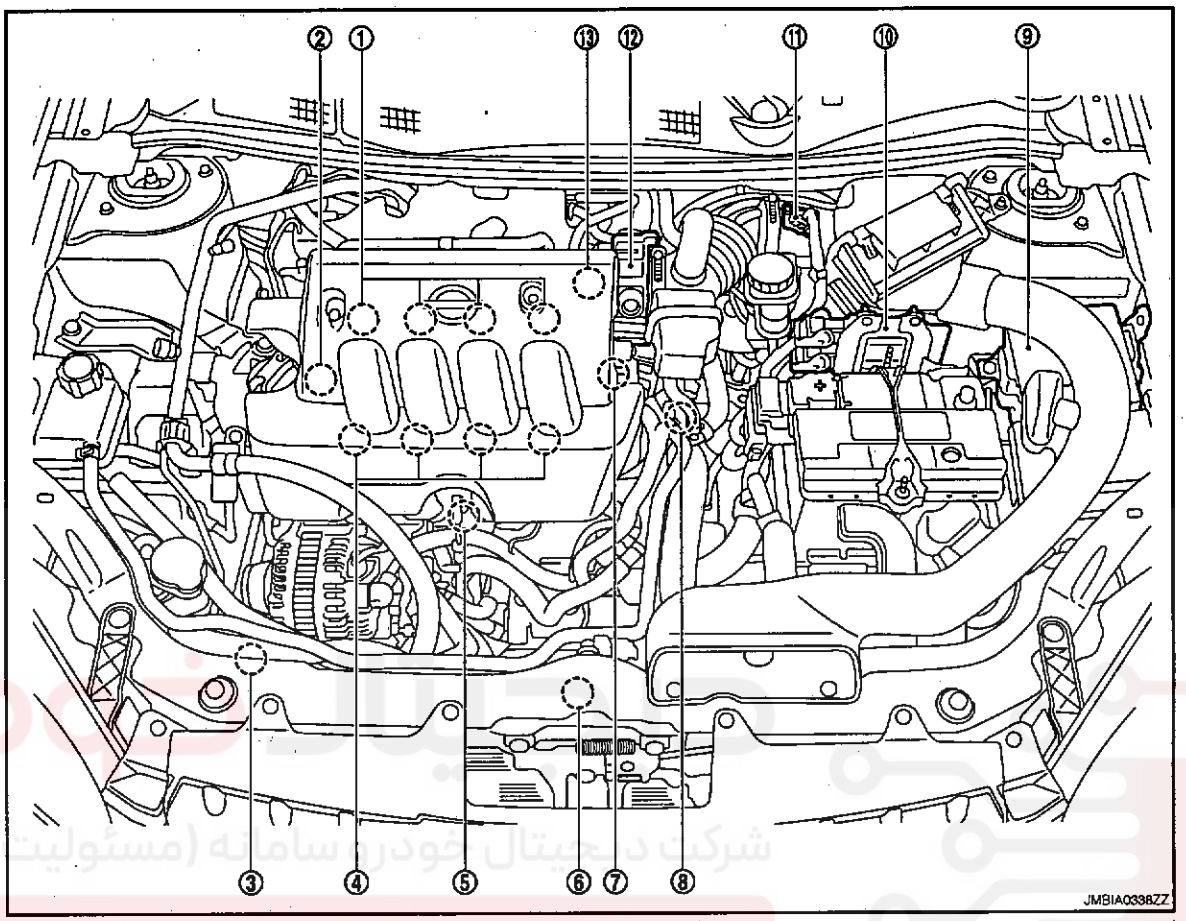
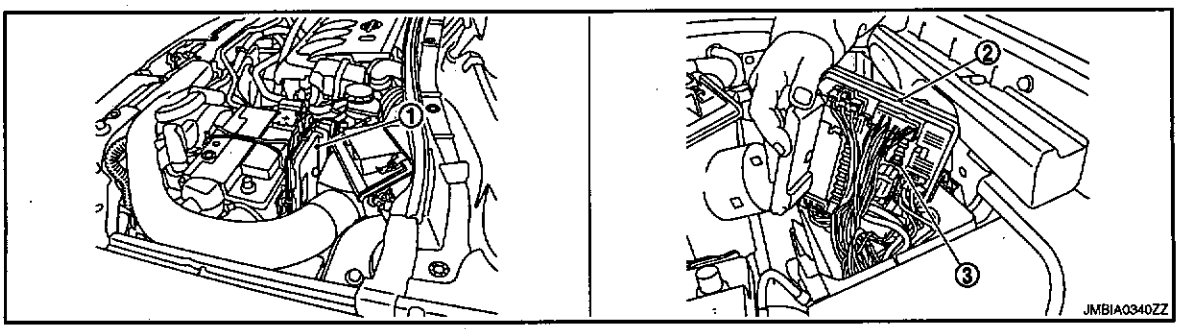
## Component Parts Location

INFOID:0000000004899798




1. Ignition coil (with power transistor) and spark plug
2. PCV valve
3. Refrigerant pressure sensor
4. Fuel injector
5. Knock sensor
6. Cooling fan motor
7. Camshaft position sensor (PHASE)
8. Engine coolant temperature sensor
9. IPDM E/R
10. ECM
11. Mass air flow sensor (with intake air temperature sensor)
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve




1. ECM
2. IPDM E/R
3. Fuel pump fuse (15A)

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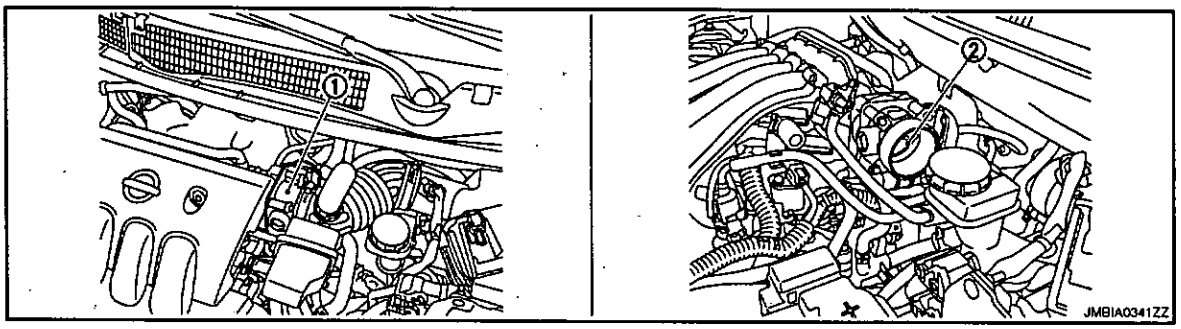
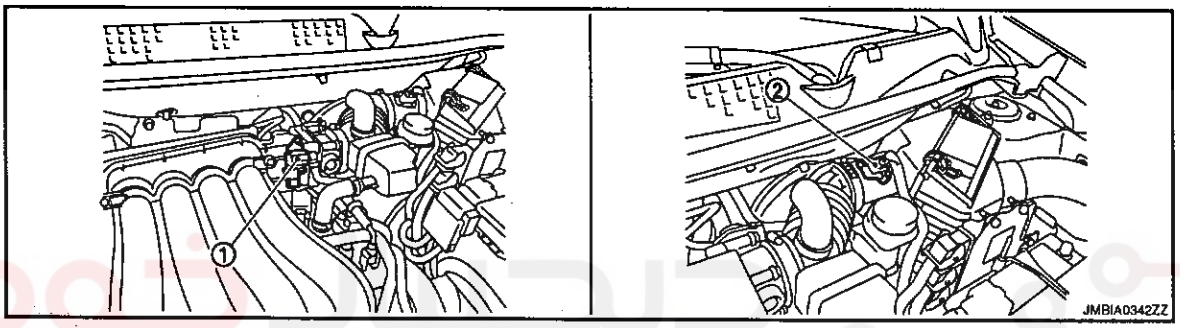
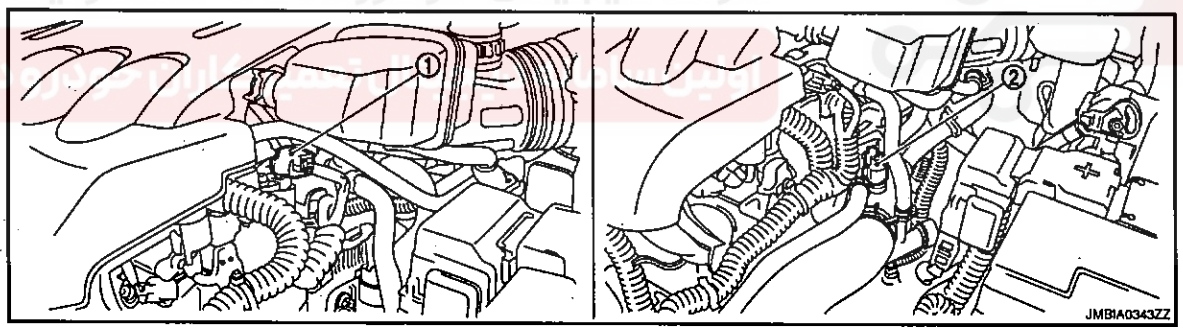


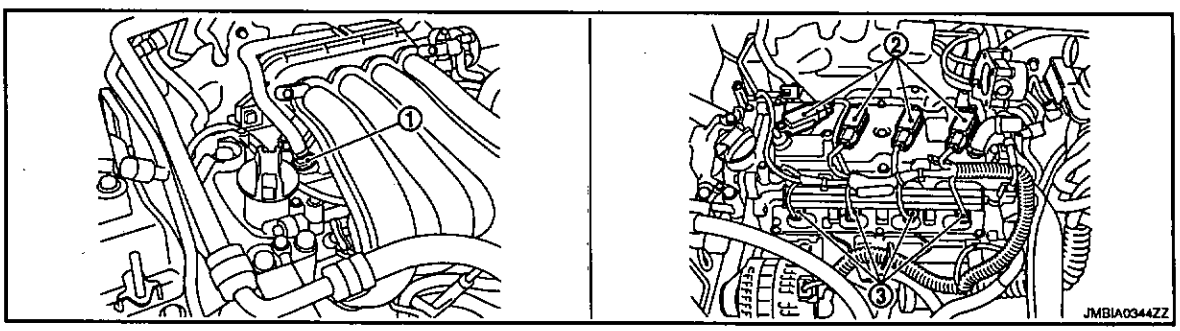

1. Electric throttle control actuator (with built-in position sensor, throttle control motor)
2. Throttle valve




1. EVAP canister purge volume control solenoid valve
2. Mass air flow sensor (with intake air temperature sensor)




1. Camshaft position sensor (PHASE)
2. Engine coolant temperature sensor




1. PCV valve
2. Ignition coil (with power transistor) and spark plug
3. Fuel injector

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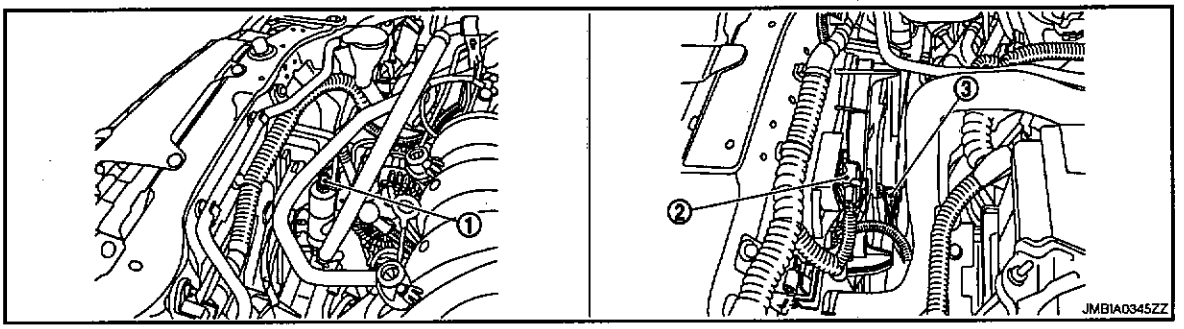
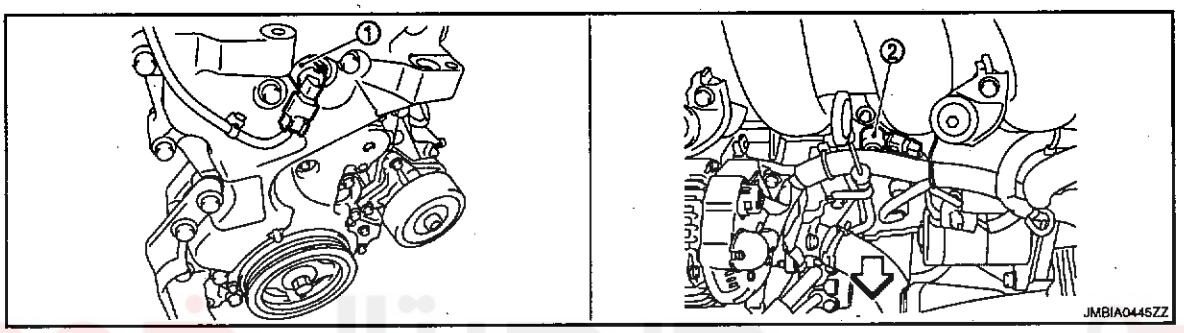
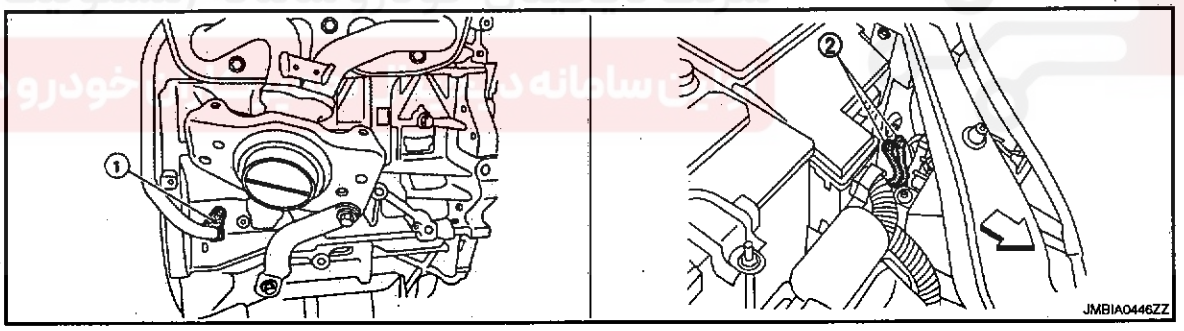



1. Refrigerant pressure sensor 2. Resister 3. Cooling fan motor



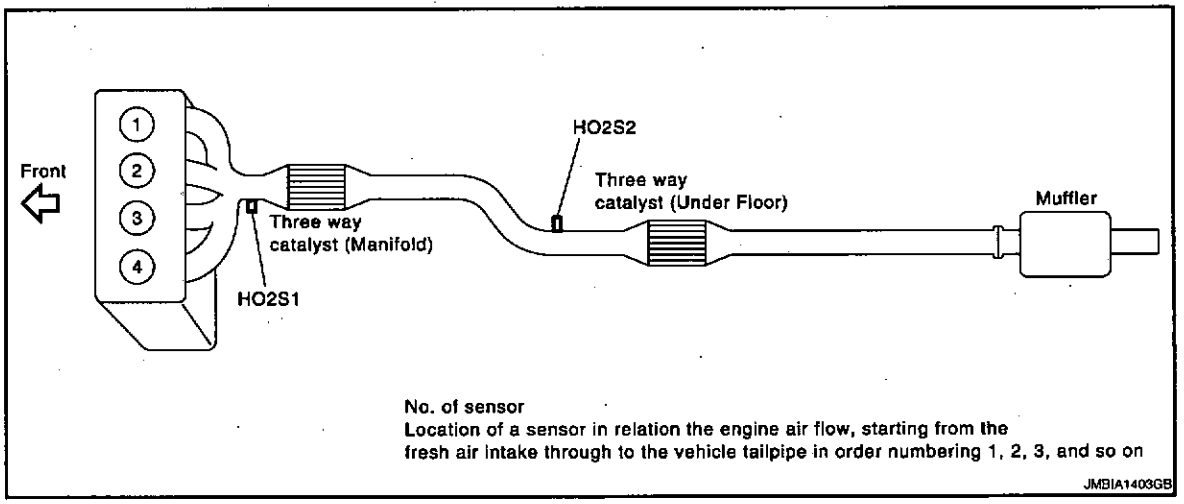

1. Intake valve timing control solenoid valve 2. Knock sensor

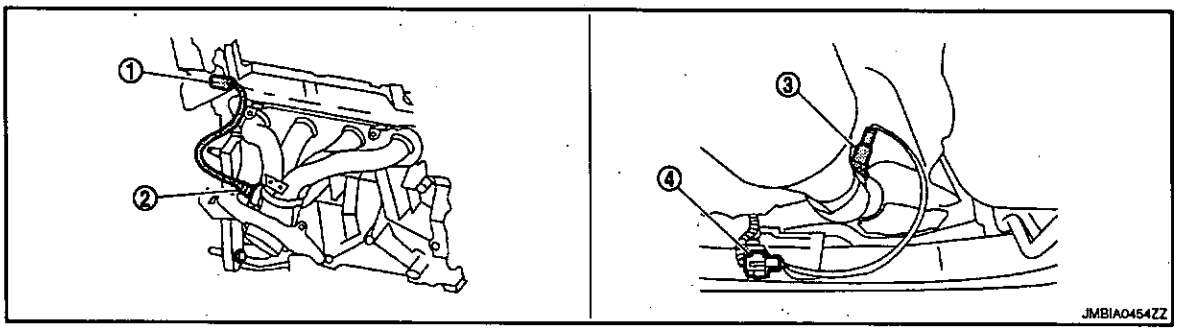
⇦ : Vehicle front



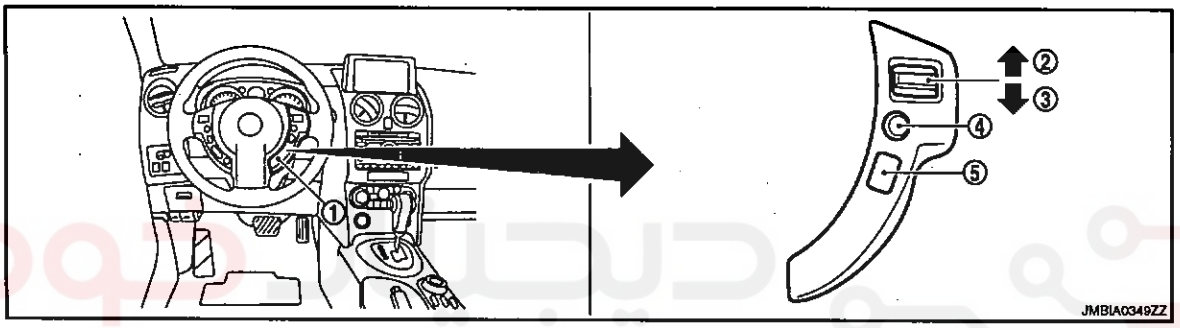

1. Crankshaft position sensor (POS) 2. Ground

⇦ : Vehicle front

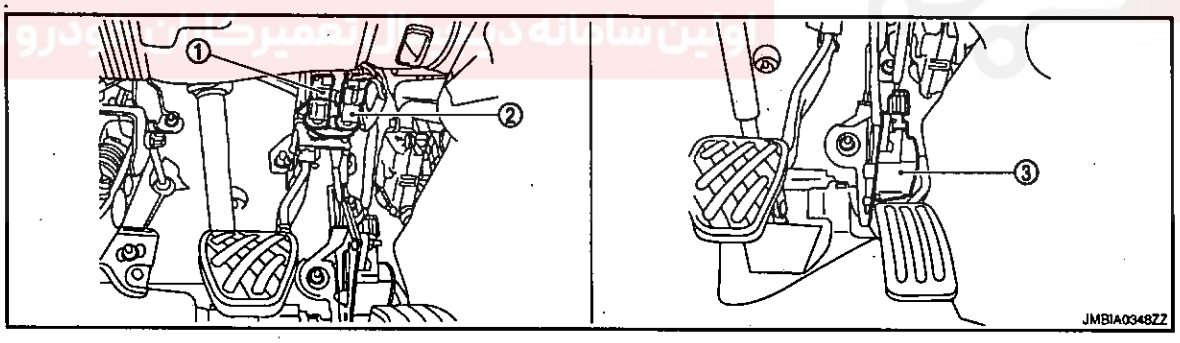




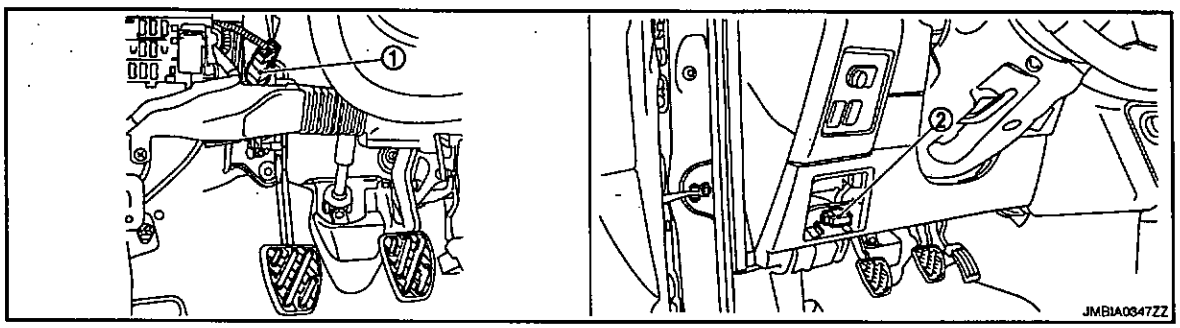

1. Heated oxygen sensor 1 harness connector
2. Heated oxygen sensor 1
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector




1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCCELERATE switch
4. SET/COAST switch
5. MAIN switch




1. Stop lamp switch
2. ASCD brake switch
3. Accelerator pedal position sensor




1. ASCD clutch switch
2. Data link connector

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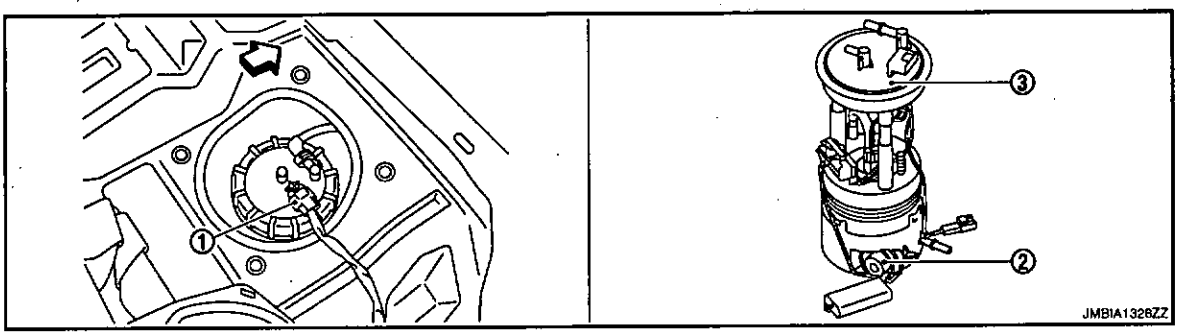



1. Fuel level sensor unit and fuel pump harness connector
2. Fuel pressure regulator
3. Fuel level sensor unit and fuel pump

⇦ : Vehicle front

## Component Description

INFOID:0000000004899799

| Component | Reference |
|---|---|
| Accelerator pedal position sensor | EC-221, "Description" |
| Camshaft position sensor (PHASE) | EC-151, "Description" |
| Crankshaft position sensor (POS) | EC-147, "Description" |
| Engine coolant temperature sensor | EC-99, "Description" |
| Fuel injector | EC-244, "Description" |
| Heated oxygen sensor 1 | EC-105, "Description" |
| Heated oxygen sensor 2 | EC-118, "Description" |
| Intake air temperature sensor | EC-96, "Description" |
| Knock sensor | EC-145, "Description" |
| Mass air flow sensor | EC-92, "Description" |
| Park/neutral position (PNP) switch | EC-215, "Description" |
| Throttle position sensor | EC-102, "Description" |



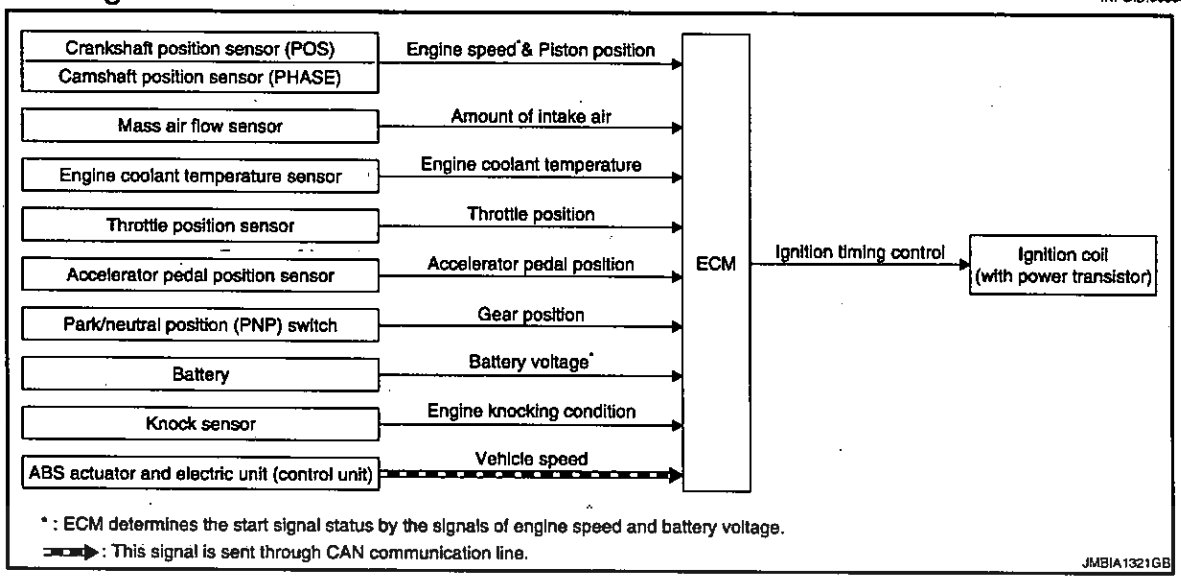


021-62999292

# ELECTRIC IGNITION SYSTEM

## System Diagram

INFOID:0000000004899800




## System Description

INFOID:0000000004899801

### INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Crankshaft position sensor (POS) | Engine speed*2 Piston position | Ignition timing control | Ignition coil (with power transistor) |
| Camshaft position sensor (PHASE) | | | |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Park/neutral position (PNP) switch | Gear position | | |
| Battery | Battery voltage*2 | | |
| Knock sensor | Engine knocking condition | | |
| ABS actuator and electric unit (control unit) | Vehicle speed*1 | | |

*1: This signal is sent to the ECM through CAN communication line.

*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

### SYSTEM DESCRIPTION

Firing order: 1 - 3 - 4 - 2

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM.

The ECM receives information such as the injection pulse width and camshaft position sensor (PHASE) signal. Computing this information, ignition signals are transmitted to the power transistor.

During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not

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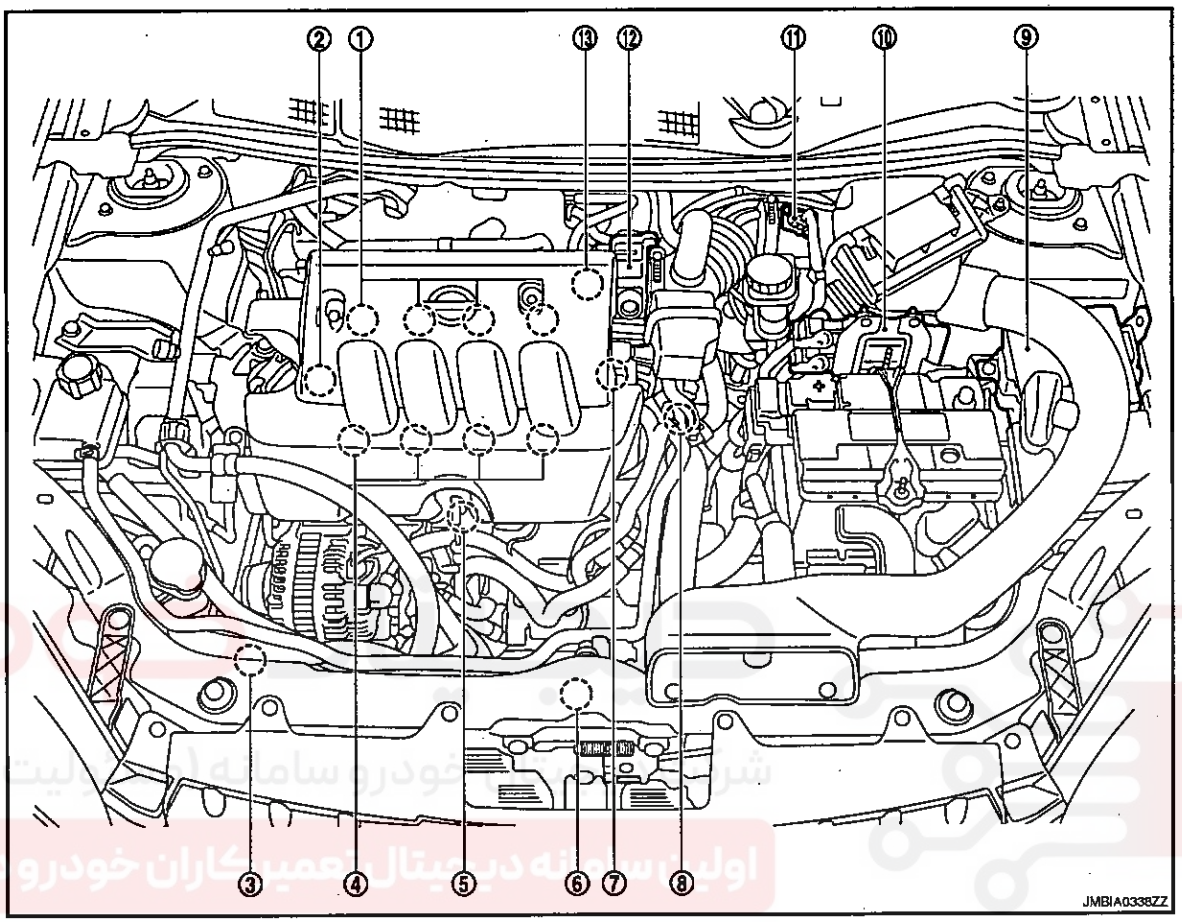
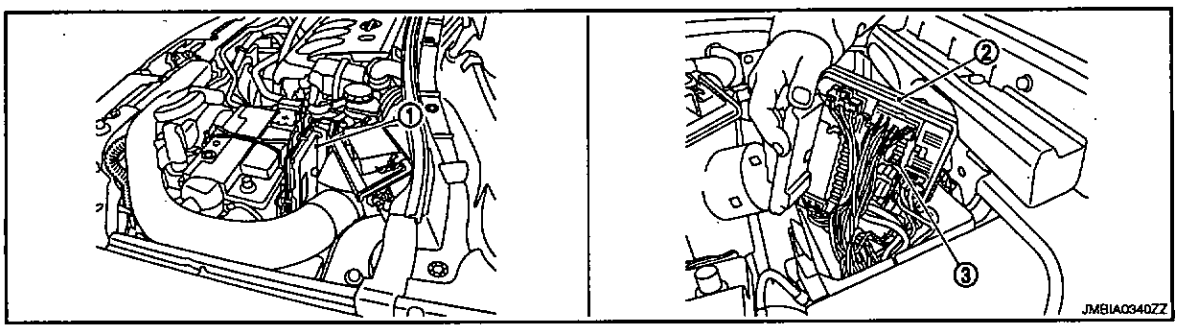
operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

## Component Parts Location

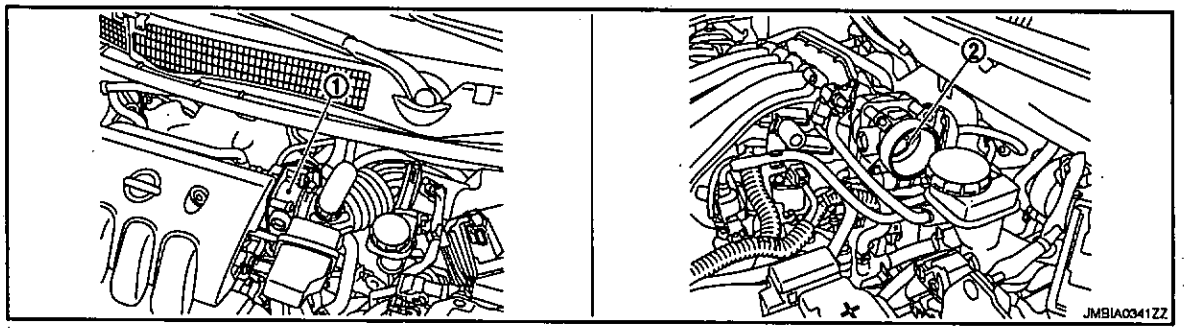
INFOID:0000000004899802



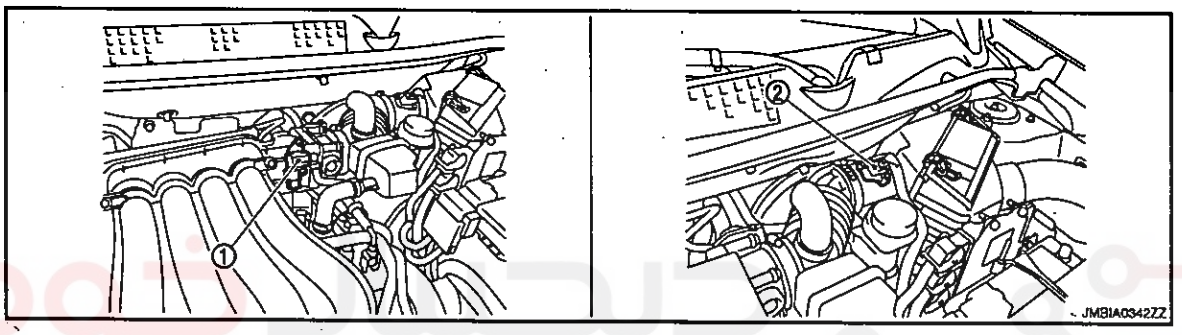

1. Ignition coil (with power transistor) and spark plug
2. PCV valve
3. Refrigerant pressure sensor
4. Fuel injector
5. Knock sensor
6. Cooling fan motor
7. Camshaft position sensor (PHASE)
8. Engine coolant temperature sensor
9. IPDM E/R
10. ECM
11. Mass air flow sensor (with intake air temperature sensor)
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



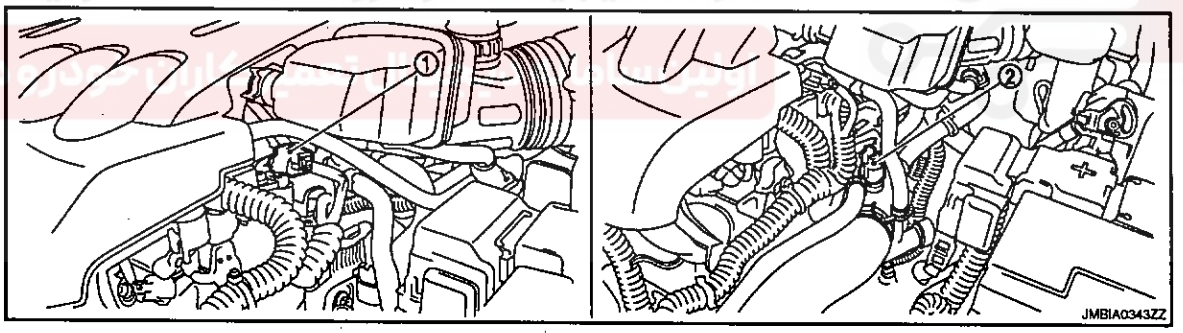

1. ECM
2. IPDM E/R
3. Fuel pump fuse (15A)



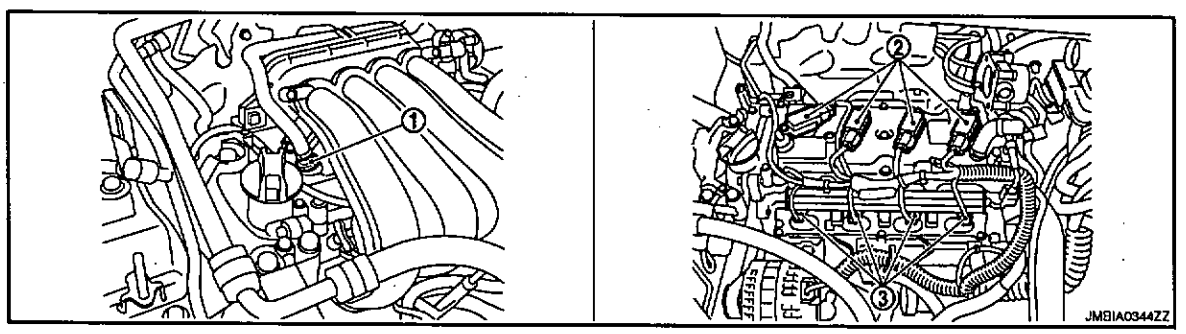

1. Electric throttle control actuator (with built-in position sensor, throttle control motor)
2. Throttle valve



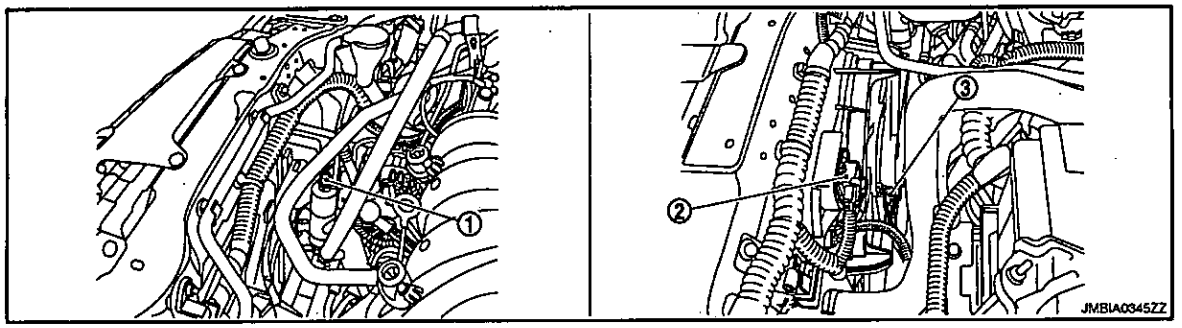

1. EVAP canister purge volume control solenoid valve
2. Mass air flow sensor (with intake air temperature sensor)



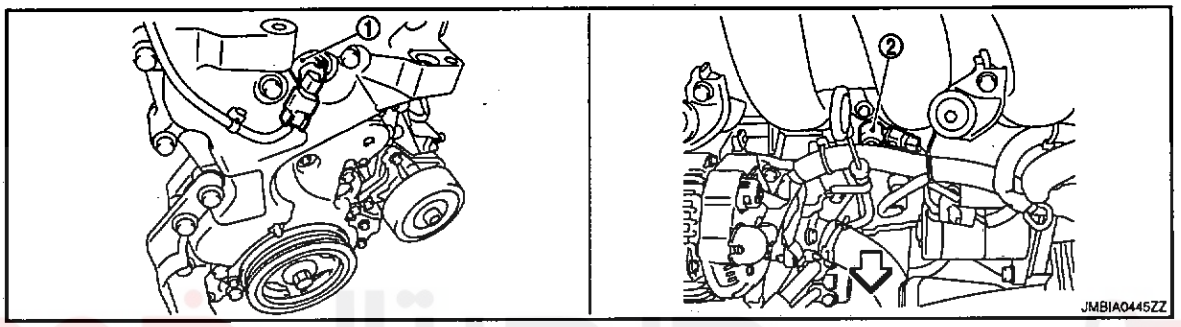

1. Camshaft position sensor (PHASE)
2. Engine coolant temperature sensor




1. PCV valve
2. Ignition coil (with power transistor) and spark plug
3. Fuel injector

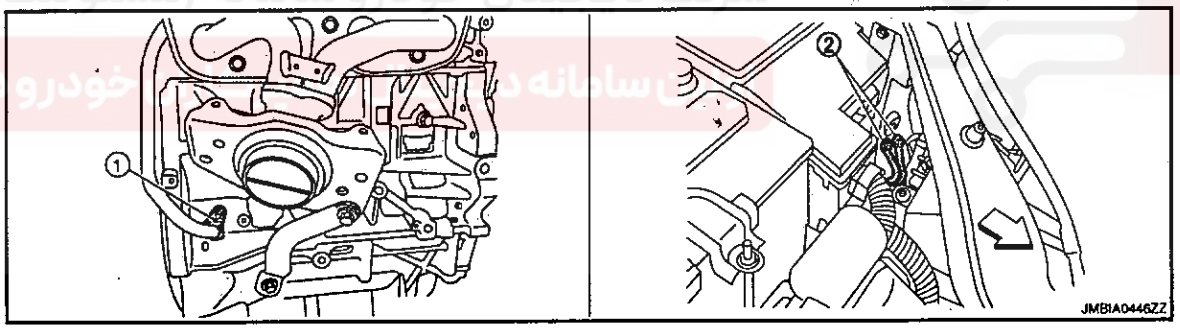



1. Refrigerant pressure sensor 2. Resister 3. Cooling fan motor



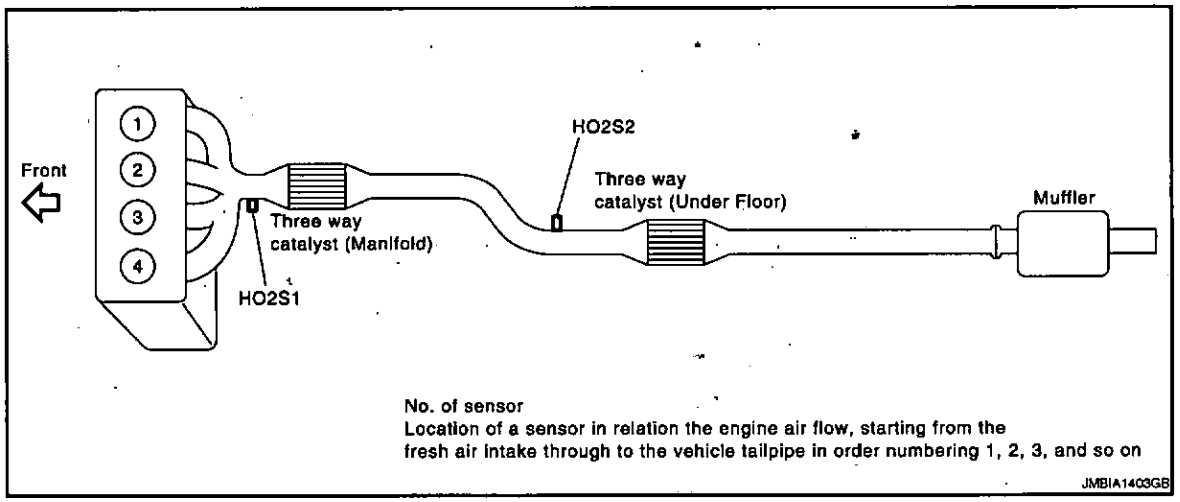

1. Intake valve timing control solenoid valve 2. Knock sensor

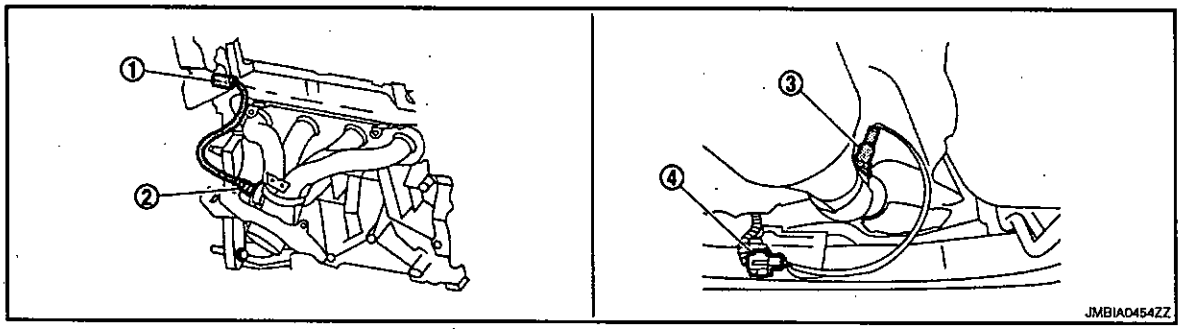
⇦ : Vehicle front



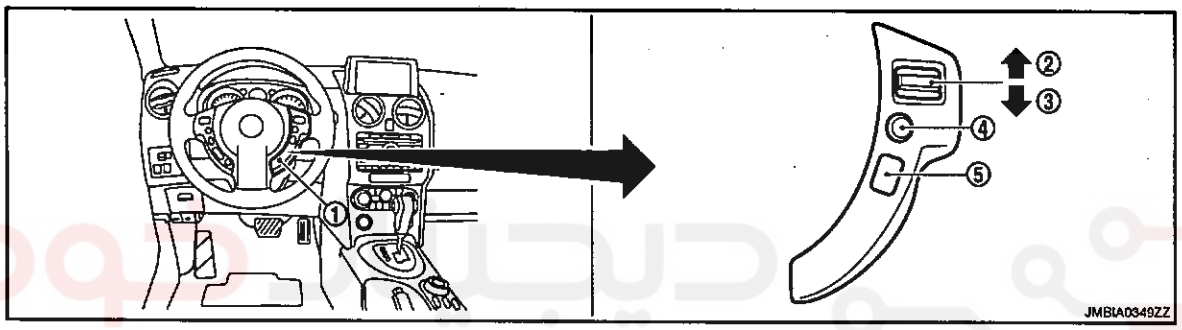

1. Crankshaft position sensor (POS) 2. Ground

⇦ : Vehicle front

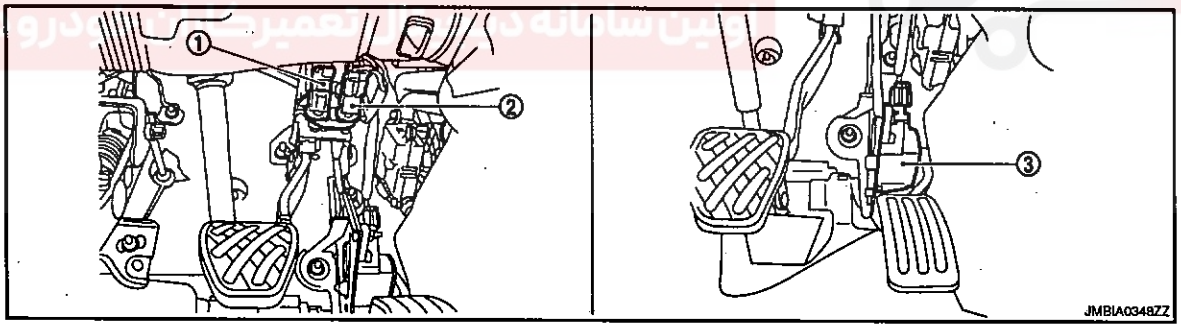




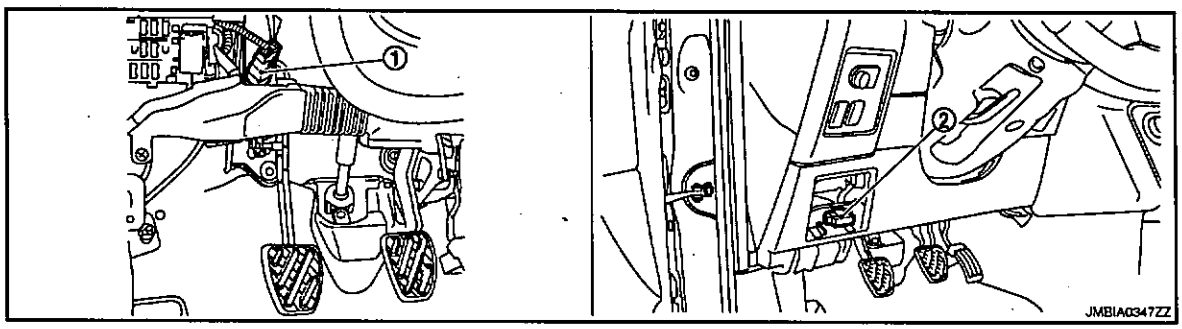

1. Heated oxygen sensor 1 harness connector
2. Heated oxygen sensor 1
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector




1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCCELERATE switch
4. SET/COAST switch
5. MAIN switch




1. Stop lamp switch
2. ASCD brake switch
3. Accelerator pedal position sensor




1. ASCD clutch switch
2. Data link connector

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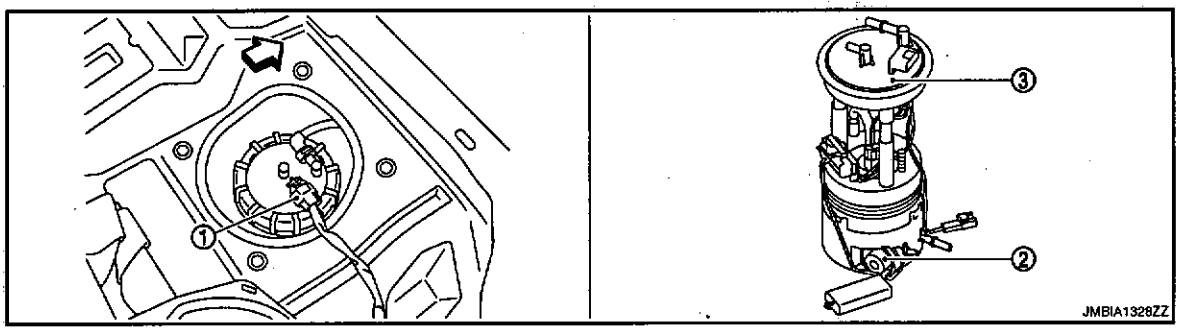


1. Fuel level sensor unit and fuel pump harness connector
2. Fuel pressure regulator
3. Fuel level sensor unit and fuel pump

⇦ : Vehicle front

## Component Description

INFOID:0000000004899803

| Component | Reference |
|---|---|
| Accelerator pedal position sensor | EC-221, "Description" |
| Camshaft position sensor (PHASE) | EC-151, "Description" |
| Crankshaft position sensor (POS) | EC-147, "Description" |
| Engine coolant temperature sensor | EC-99, "Description" |
| Ignition coil (with power transistor) | EC-249, "Description" |
| Knock sensor | EC-145, "Description" |
| Mass air flow sensor | EC-92, "Description" |
| Park/neutral position (PNP) switch | EC-215, "Description" |
| Throttle position sensor | EC-102, "Description" |

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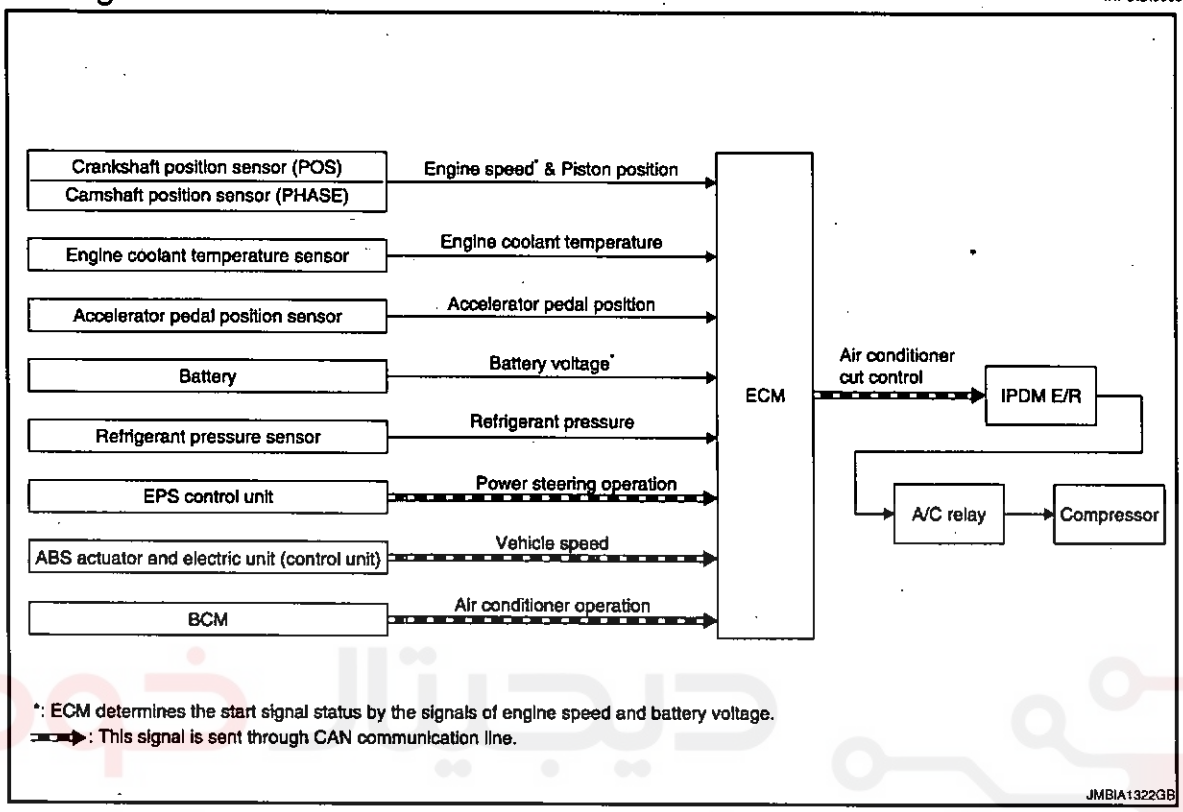
# AIR CONDITIONING CUT CONTROL

## System Diagram

INFOID:0000000004899804




## System Description

INFOID:0000000004899805

### INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Crankshaft position sensor (POS) | Engine speed*2<br>Piston position | Air conditioner cut control | IPDM E/R<br>↓<br>Air conditioner relay<br>↓<br>Compressor |
| Camshaft position sensor (PHASE) | | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Battery | Battery voltage*2 | | |
| Refrigerant pressure sensor | Refrigerant pressure | | |
| EPS control unit | Power steering operation*1 | | |
| ABS actuator and electric unit (control unit) | Vehicle speed*1 | | |
| BCM | Air conditioner operation*1 | | |

*1: This signal is sent to the ECM through CAN communication line.

*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

### SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.



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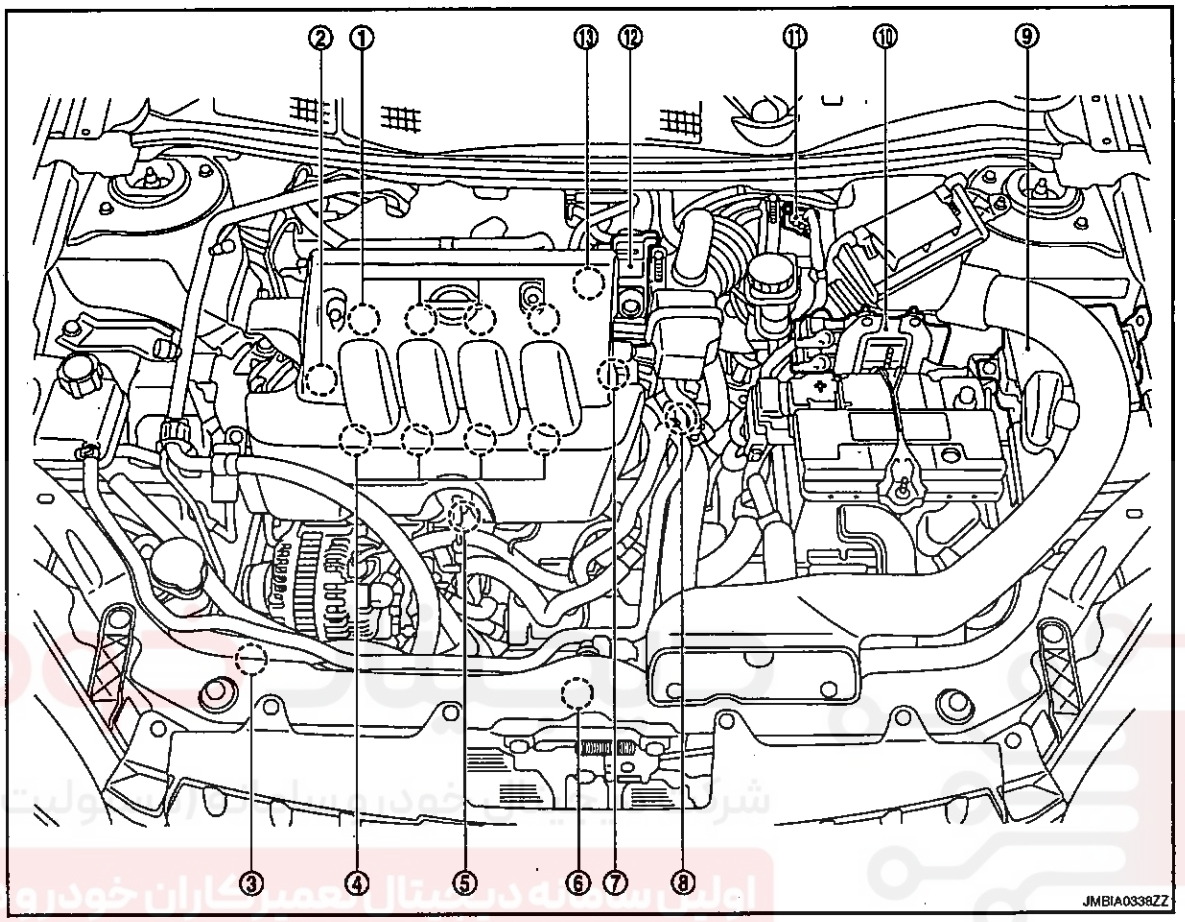
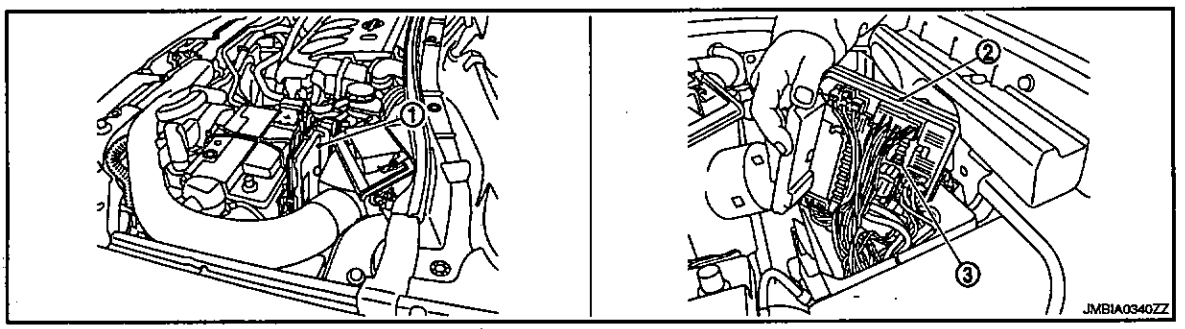
• When refrigerant pressure is excessively low or high.

## Component Parts Location

INFOID:0000000004899806




1. Ignition coil (with power transistor) and spark plug
2. PCV valve
3. Refrigerant pressure sensor
4. Fuel injector
5. Knock sensor
6. Cooling fan motor
7. Camshaft position sensor (PHASE)
8. Engine coolant temperature sensor
9. IPDM E/R
10. ECM
11. Mass air flow sensor (with intake air temperature sensor)
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve




1. ECM
2. IPDM E/R
3. Fuel pump fuse (15A)

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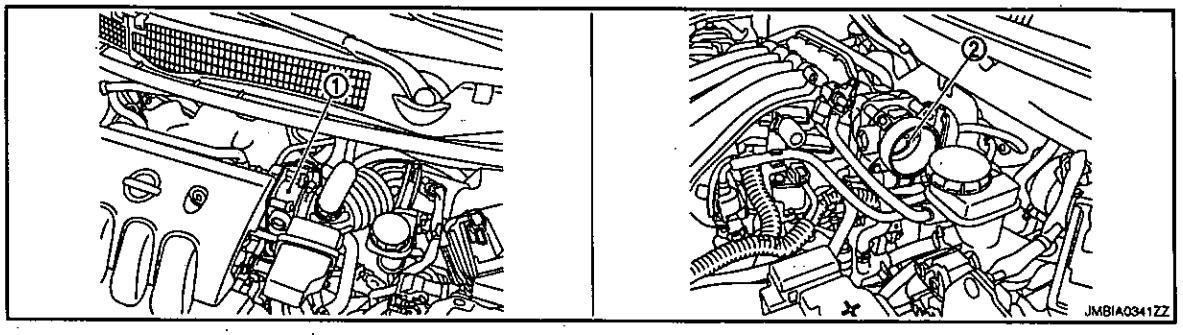
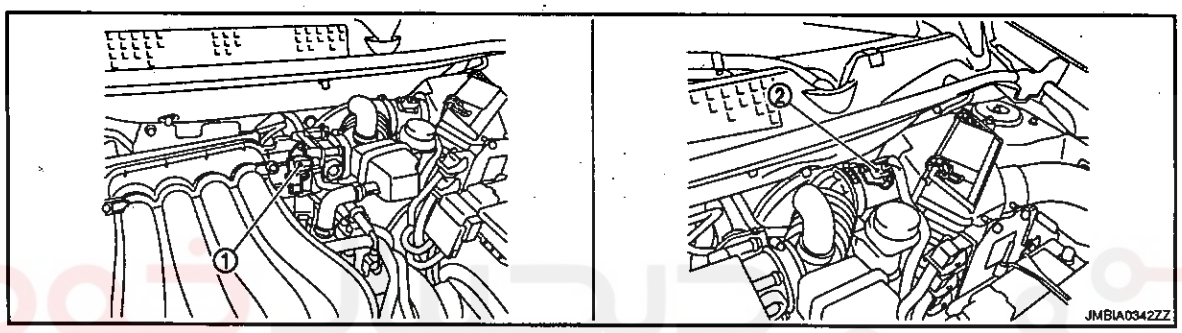
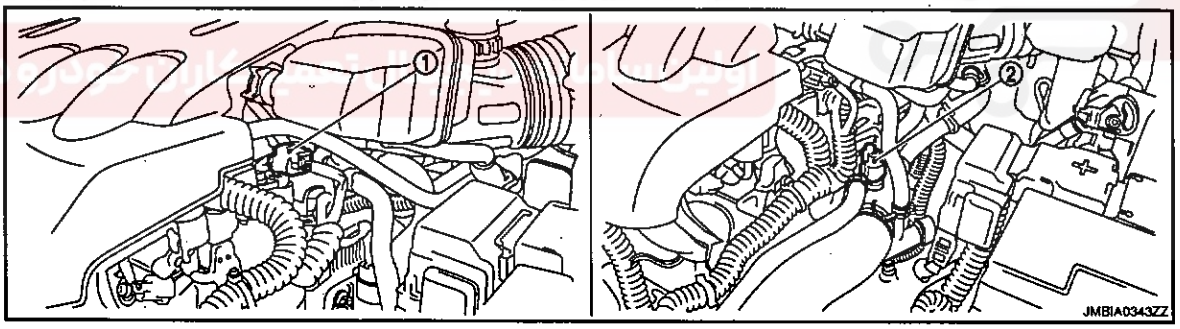


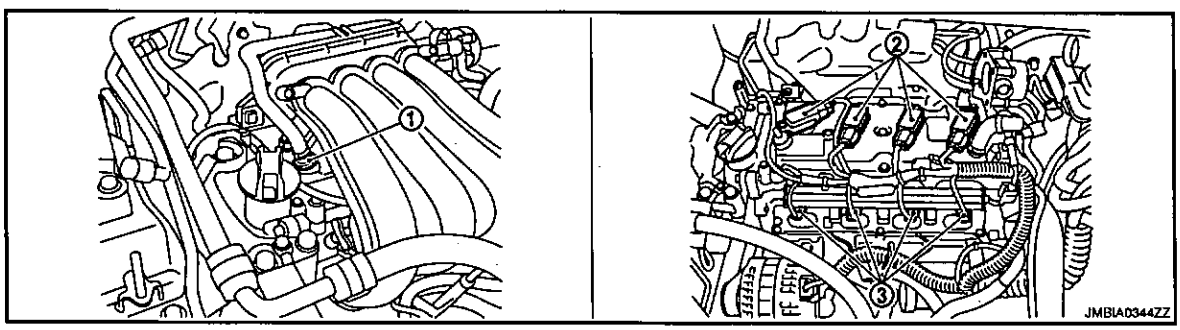

1. Electric throttle control actuator (with built-in position sensor, throttle control motor)
2. Throttle valve




1. EVAP canister purge volume control solenoid valve
2. Mass air flow sensor (with intake air temperature sensor)




1. Camshaft position sensor (PHASE)
2. Engine coolant temperature sensor




1. PCV valve
2. Ignition coil (with power transistor) and spark plug
3. Fuel injector

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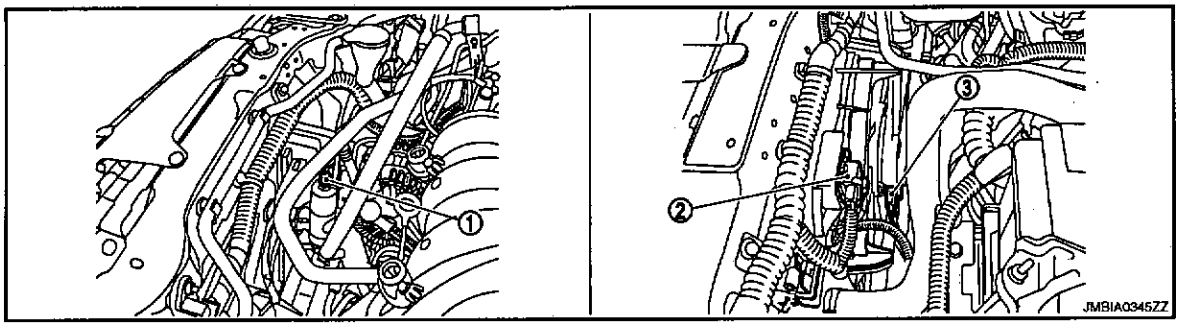
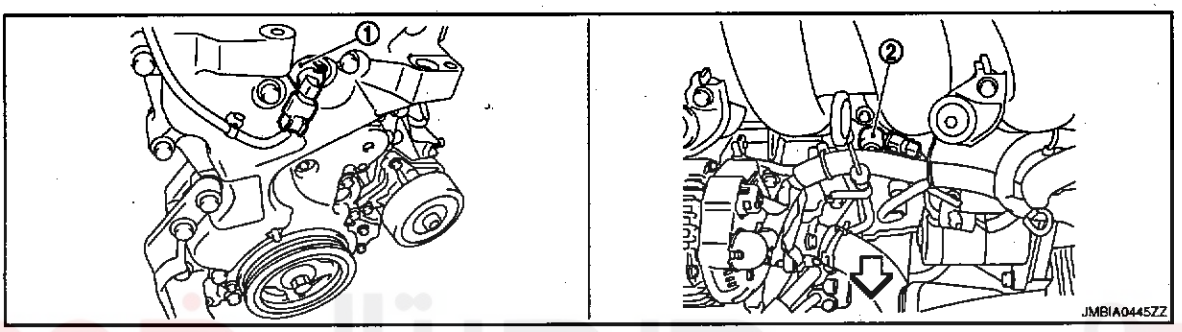
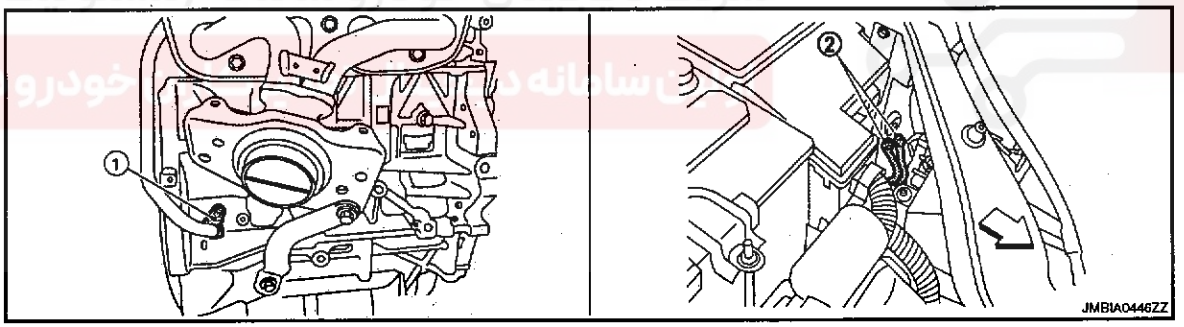



1. Refrigerant pressure sensor 2. Resister 3. Cooling fan motor



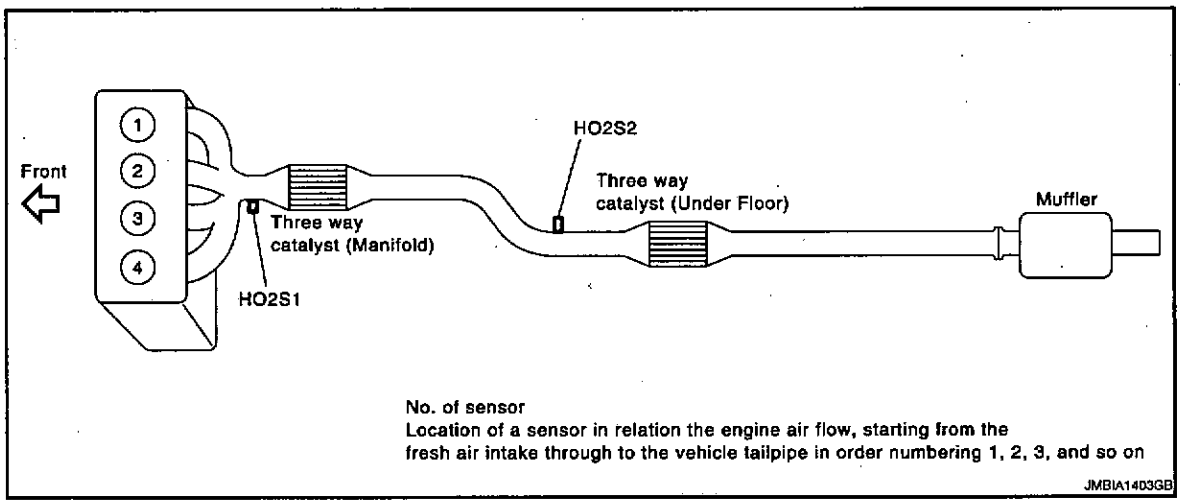

1. Intake valve timing control solenoid valve 2. Knock sensor

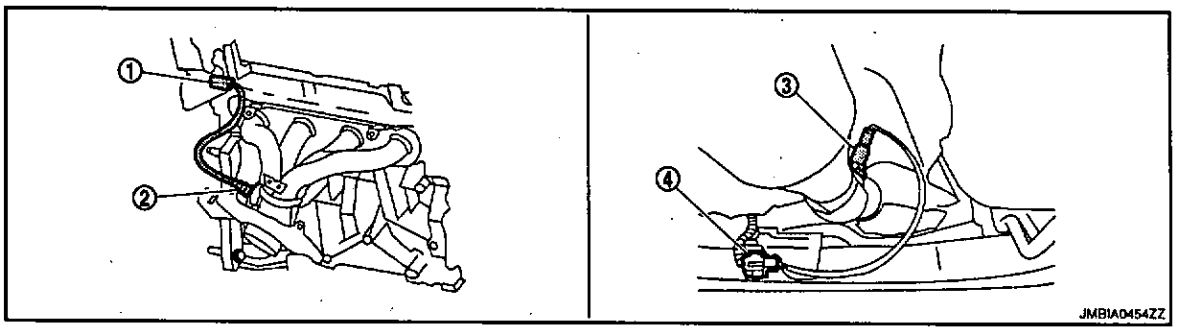
⇦ : Vehicle front



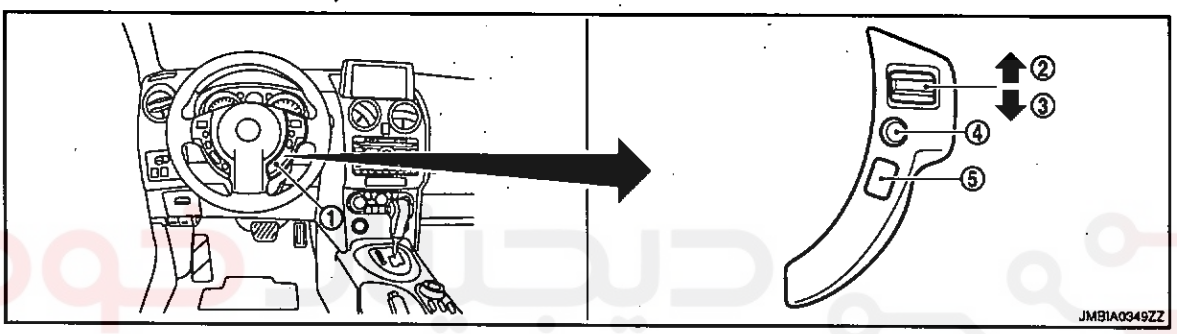

1. Crankshaft position sensor (POS) 2. Ground

⇦ : Vehicle front

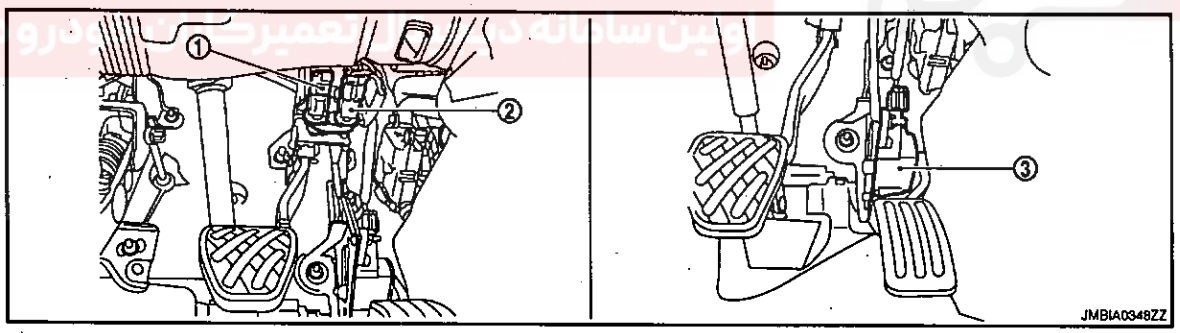




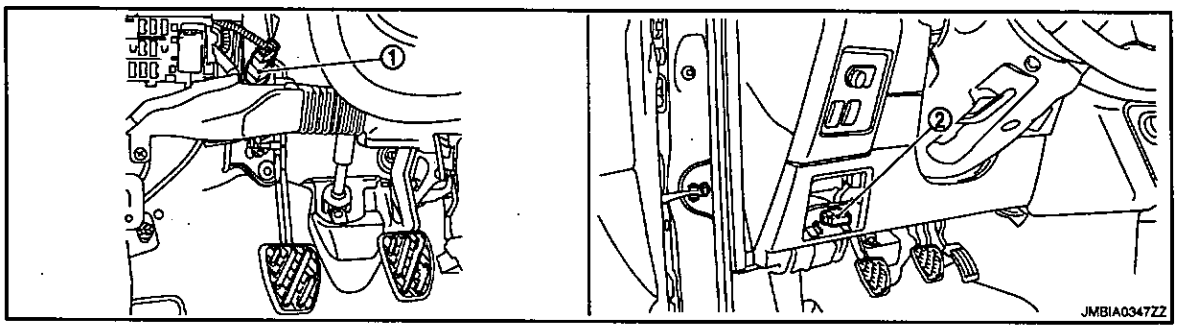

1. Heated oxygen sensor 1 harness connector
2. Heated oxygen sensor 1
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector




1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCCELERATE switch
4. SET/COAST switch
5. MAIN switch




1. Stop lamp switch
2. ASCD brake switch
3. Accelerator pedal position sensor




1. ASCD clutch switch
2. Data link connector

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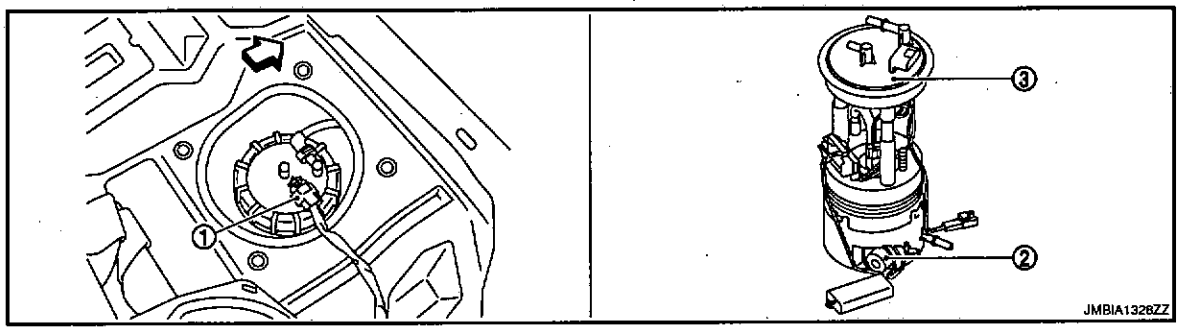


1. Fuel level sensor unit and fuel pump harness connector
2. Fuel pressure regulator
3. Fuel level sensor unit and fuel pump

⇦ : Vehicle front

## Component Description

INFOID:0000000004899807

| Component | Reference |
|---|---|
| Accelerator pedal position sensor | EC-221, "Description" |
| Camshaft position sensor (PHASE) | EC-151, "Description" |
| Crankshaft position sensor (POS) | EC-147, "Description" |
| Engine coolant temperature sensor | EC-99, "Description" |
| Refrigerant pressure sensor | EC-256, "Description" |

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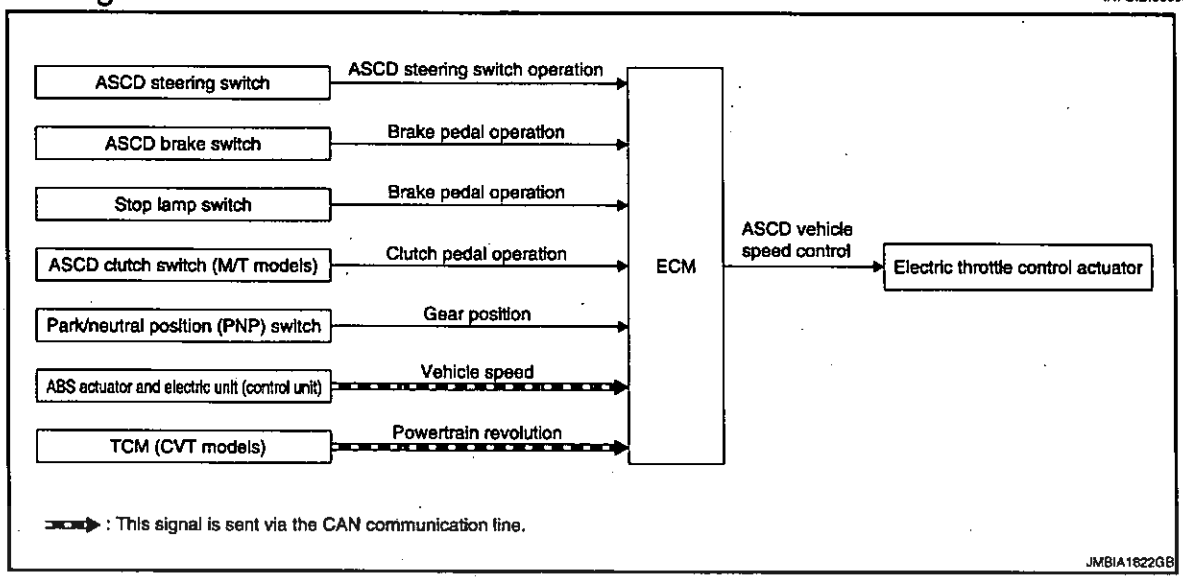
# AUTOMATIC SPEED CONTROL DEVICE (ASCD)

## System Diagram

INFOID:0000000004899808




## System Description

INFOID:0000000004899809

### INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|---|---|---|---|
| ASCD steering switch | ASCD steering switch operation | ASCD vehicle speed control | Electric throttle control actuator |
| ASCD brake switch | Brake pedal operation | | |
| Stop lamp switch | | | |
| ASCD clutch switch (M/T models) | Clutch pedal operation | | |
| Park/neutral position (PNP) switch | Gear position | | |
| ABS actuator and electric unit (control unit) | Vehicle speed* | | |
| TCM (M/T models) | Powertrain revolution* | | |

*: This signal is sent to the ECM via the CAN communication line.

### BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.
Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 190 km/h (118 MPH) (For the Middle East), 40 km/h (25 MPH) and 160 km/h (100 MPH) (Except for the Middle East).
ECM controls throttle angle of electric throttle control actuator to regulate engine speed.
Operation status of ASCD is indicated by CRUISE lamp and SET lamp in combination meter. If any malfunction occurs in the ASCD system, it automatically deactivates control.
**NOTE:**
**Always drive vehicle in a safe manner according to traffic conditions and obey all traffic laws.**

### SET OPERATION

Press MAIN switch. (The CRUISE lamp in combination meter illuminates.)
When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 190 km/h (118 MPH) (For the Middle East) or 40 km/h (25 MPH) and 160 km/h (100 MPH) (Except for the Middle East), press SET/COAST switch. (Then SET lamp in combination meter illuminates.)

### ACCELERATE OPERATION

If the RESUME/ACCELERATE switch is pressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.
And then ASCD will maintain the new set speed.



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## CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is pressed
- More than 2 switches at ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed
- Clutch pedal is depressed or gear position is changed to neutral position (M/T models)
- Selector lever position is changed to N, P, R
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- TCS system is operated

When the ECM detects any of the following conditions, the ECM will cancel the cruise operation and inform the driver by blinking indicator lamp.

- Engine coolant temperature is slightly higher than the normal operating temperature, CRUISE lamp may blink slowly.
  When the engine coolant temperature decreases to the normal operating temperature, CRUISE lamp will stop blinking and the cruise operation will be able to work by pressing SET/COAST switch or RESUME/ ACCELERATE switch.
- Malfunction for some self-diagnoses regarding ASCD control: SET lamp will blink quickly.

If MAIN switch is turned to OFF while ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

## COAST OPERATION

When the SET/COAST switch is pressed during cruise control driving, decrease vehicle set speed until the switch is released. And then ASCD will maintain the new set speed.

## RESUME OPERATION

When the RESUME/ACCELERATE switch is pressed after cancel operation other than pressing MAIN switch is performed, vehicle speed will return to last set speed. To resume vehicle set speed, vehicle condition must meet following conditions.

- Brake pedal is released
- Clutch pedal is released (M/T models)
- Selector lever position is other than P and N (CVT models)
- Vehicle speed is between 40 km/h (25 MPH) and 190 km/h (118 MPH) (For the Middle East) or 40 km/h (25 MPH) and 160 km/h (100 MPH) (Except for the Middle East)

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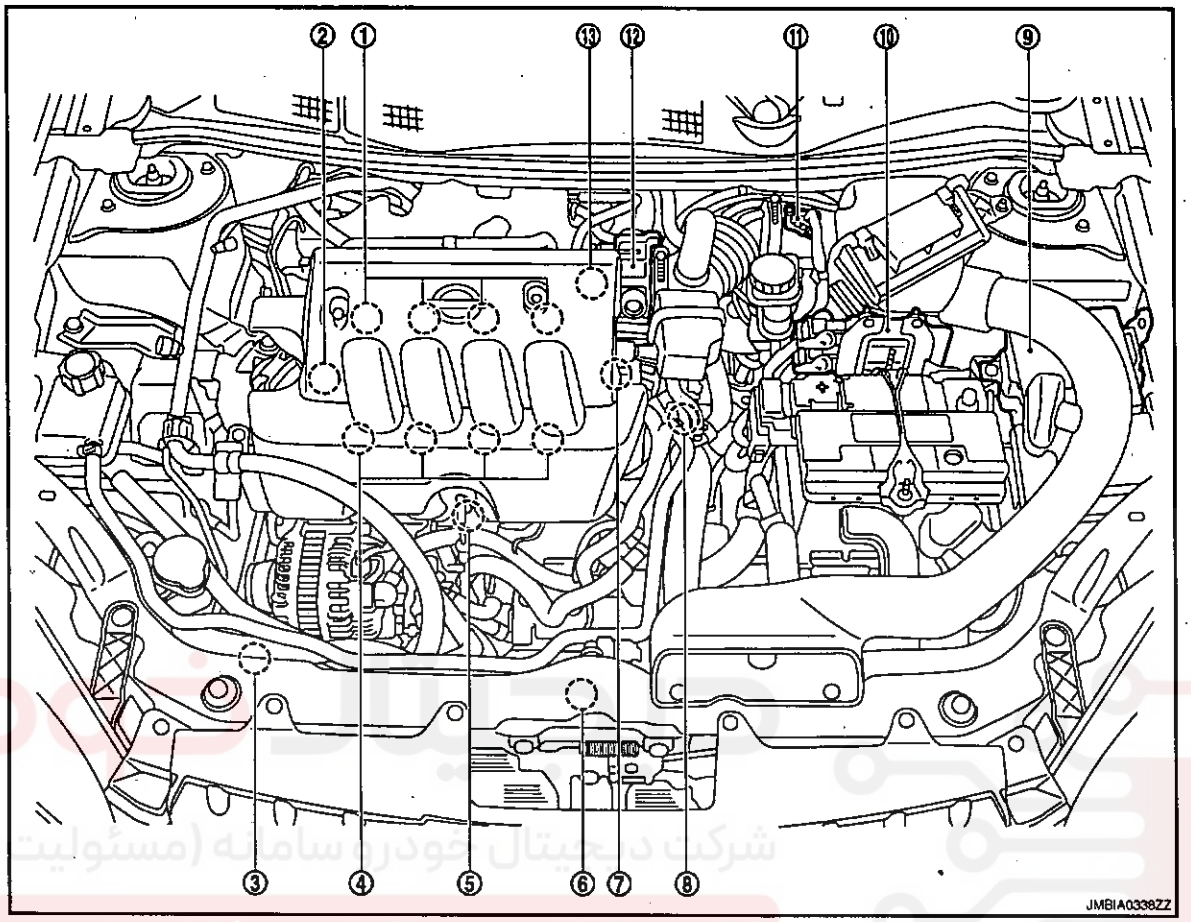
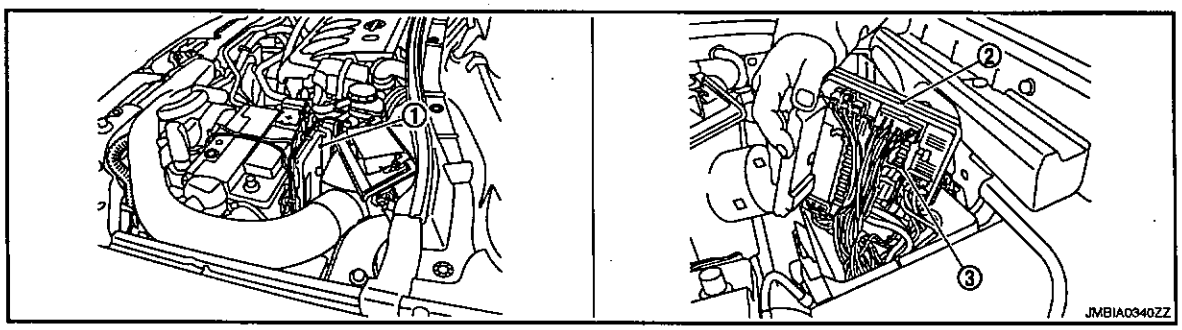
## Component Parts Location

INFOID:0000000004899810




1. Ignition coil (with power transistor) and spark plug
2. PCV valve
3. Refrigerant pressure sensor
4. Fuel injector
5. Knock sensor
6. Cooling fan motor
7. Camshaft position sensor (PHASE)
8. Engine coolant temperature sensor
9. IPDM E/R
10. ECM
11. Mass air flow sensor (with intake air temperature sensor)
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve




1. ECM
2. IPDM E/R
3. Fuel pump fuse (15A)



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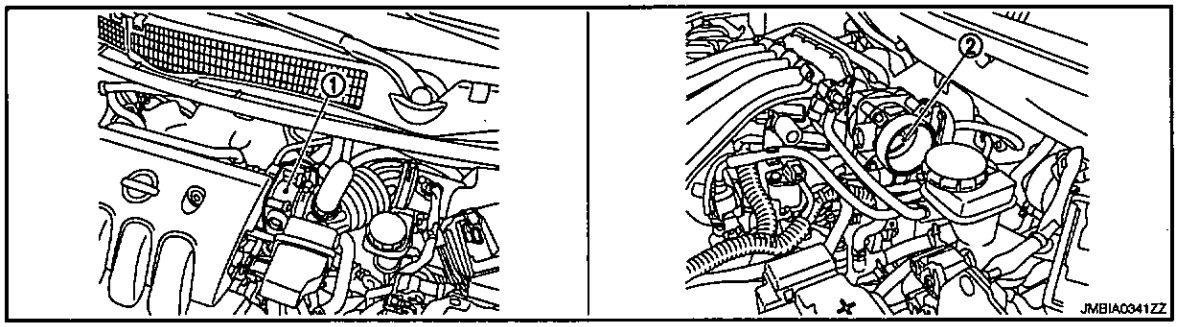
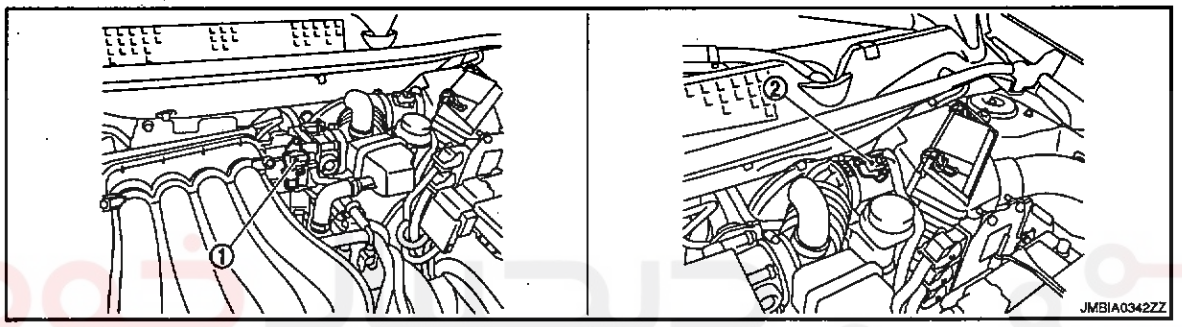
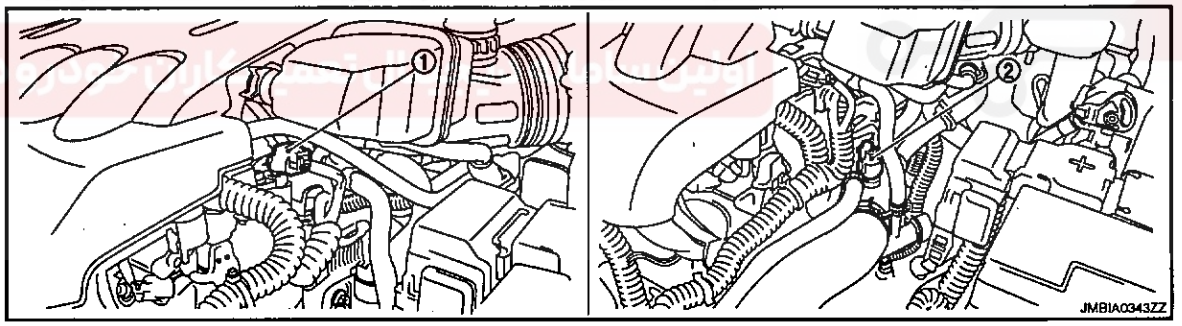


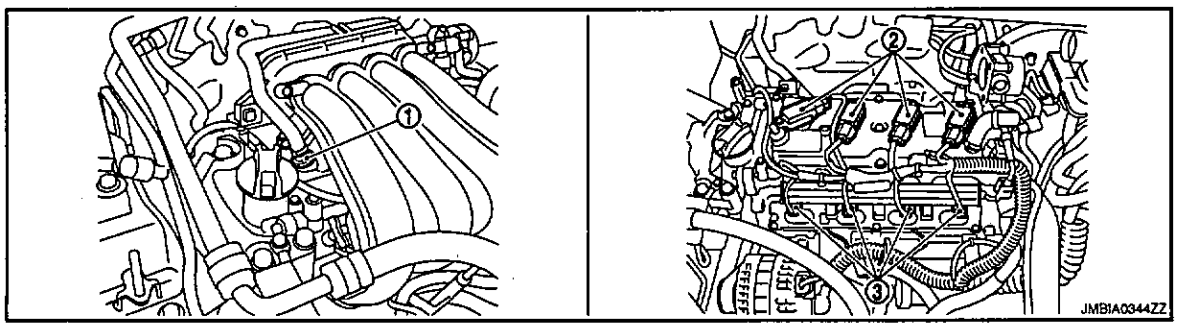

1. Electric throttle control actuator (with built-in position sensor, throttle control motor)
2. Throttle valve




1. EVAP canister purge volume control solenoid valve
2. Mass air flow sensor (with intake air temperature sensor)




1. Camshaft position sensor (PHASE)
2. Engine coolant temperature sensor




1. PCV valve
2. Ignition coil (with power transistor) and spark plug
3. Fuel injector

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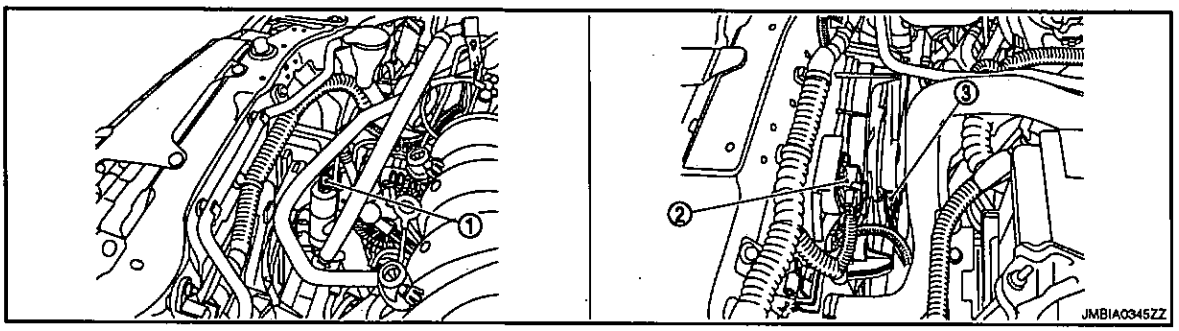
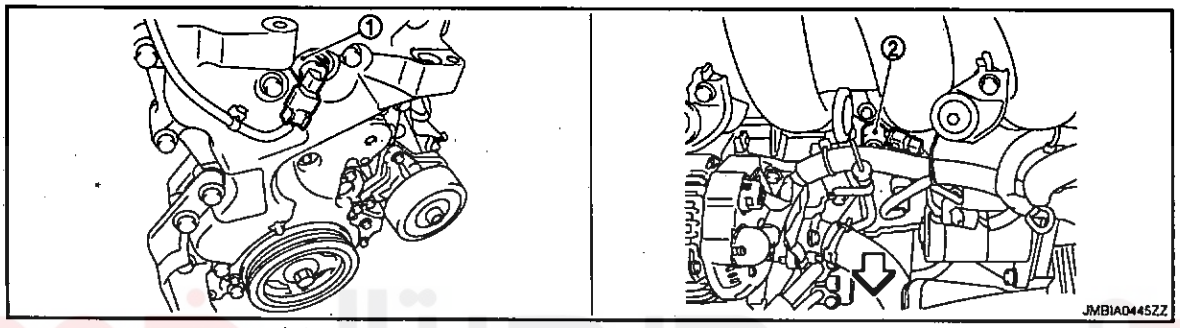
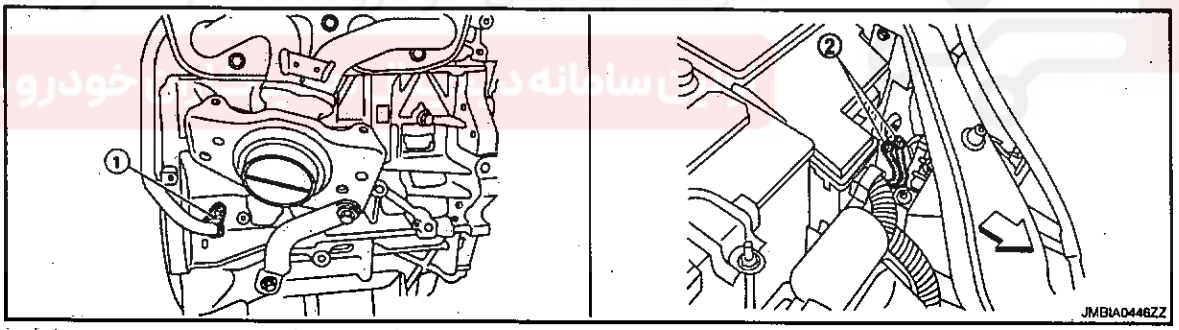



1. Refrigerant pressure sensor 2. Resister 3. Cooling fan motor



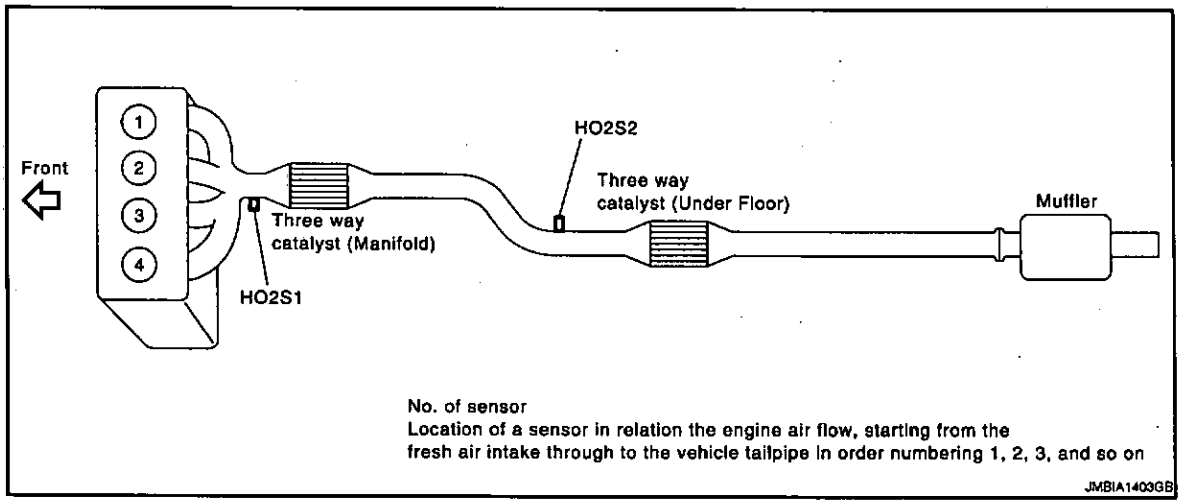

1. Intake valve timing control solenoid valve 2. Knock sensor

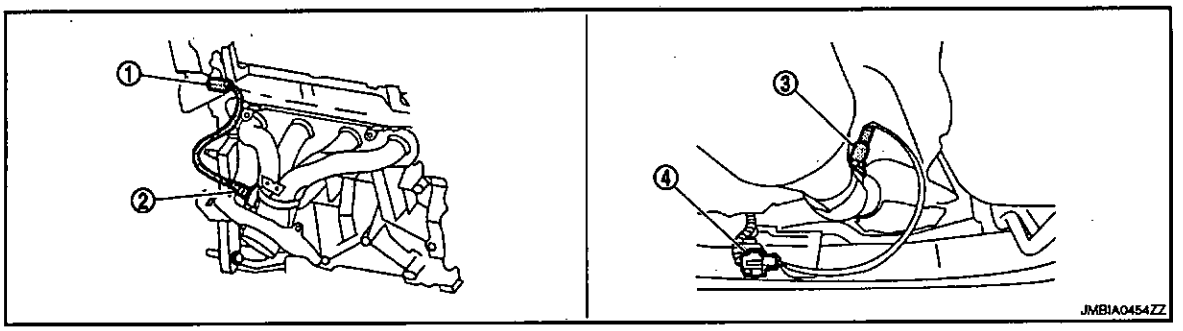
⇦ : Vehicle front



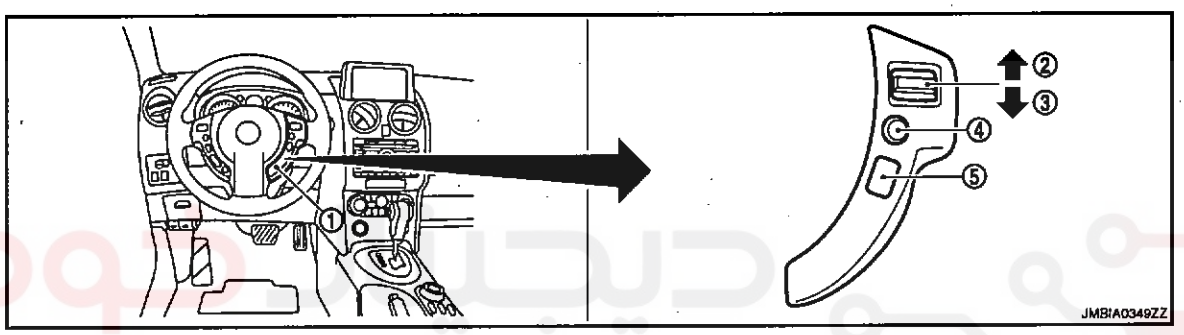

1. Crankshaft position sensor (POS) 2. Ground

⇦ : Vehicle front

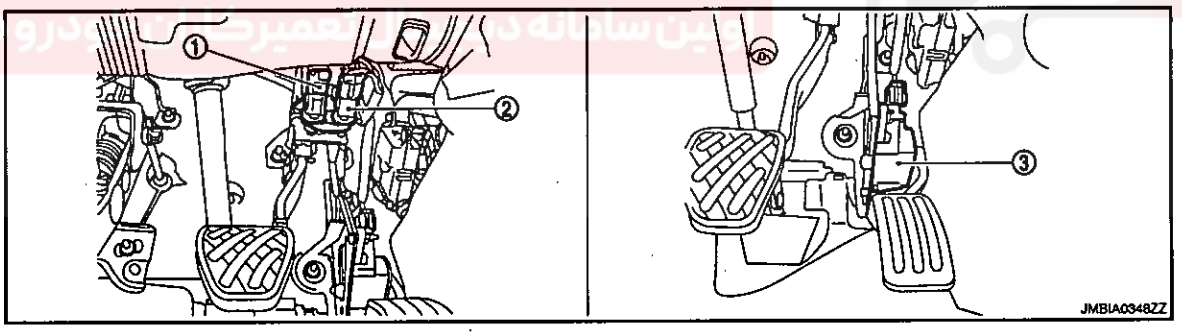




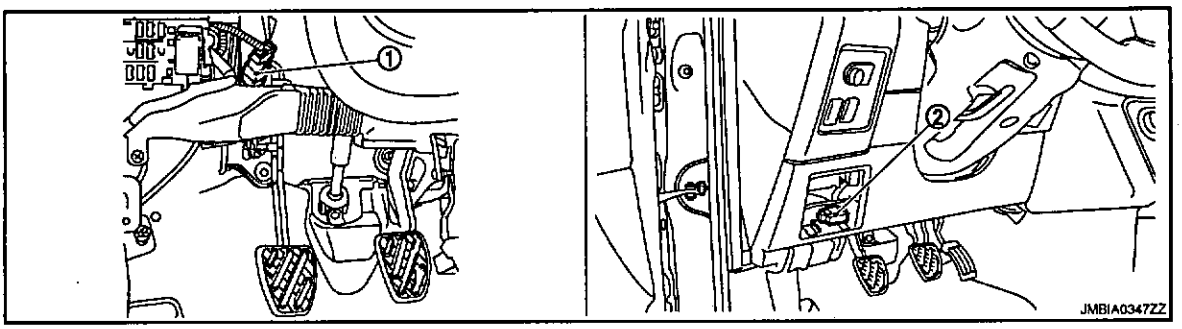

1. Heated oxygen sensor 1 harness connector
2. Heated oxygen sensor 1
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector




1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCCELERATE switch
4. SET/COAST switch
5. MAIN switch




1. Stop lamp switch
2. ASCD brake switch
3. Accelerator pedal position sensor




1. ASCD clutch switch
2. Data link connector

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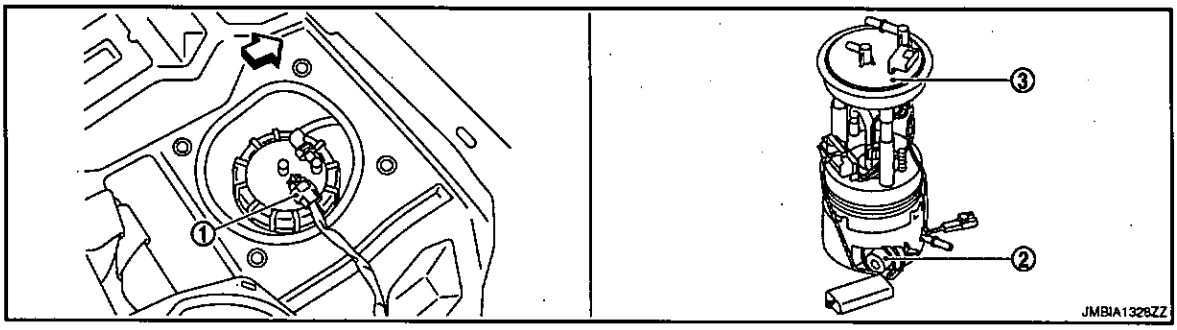


1. Fuel level sensor unit and fuel pump harness connector
2. Fuel pressure regulator
3. Fuel level sensor unit and fuel pump

⇦ : Vehicle front

## Component Description

INFOID:0000000004899811

| Component | Reference |
|---|---|
| ASCD steering switch | EC-204, "Description" |
| ASCD brake switch | EC-207, "Description" |
| ASCD indicator | EC-239, "Description" |
| Stop lamp switch | EC-218, "Description" |
| Electric throttle control actuator | EC-167, "Description" |

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# CAN COMMUNICATION

## System Description

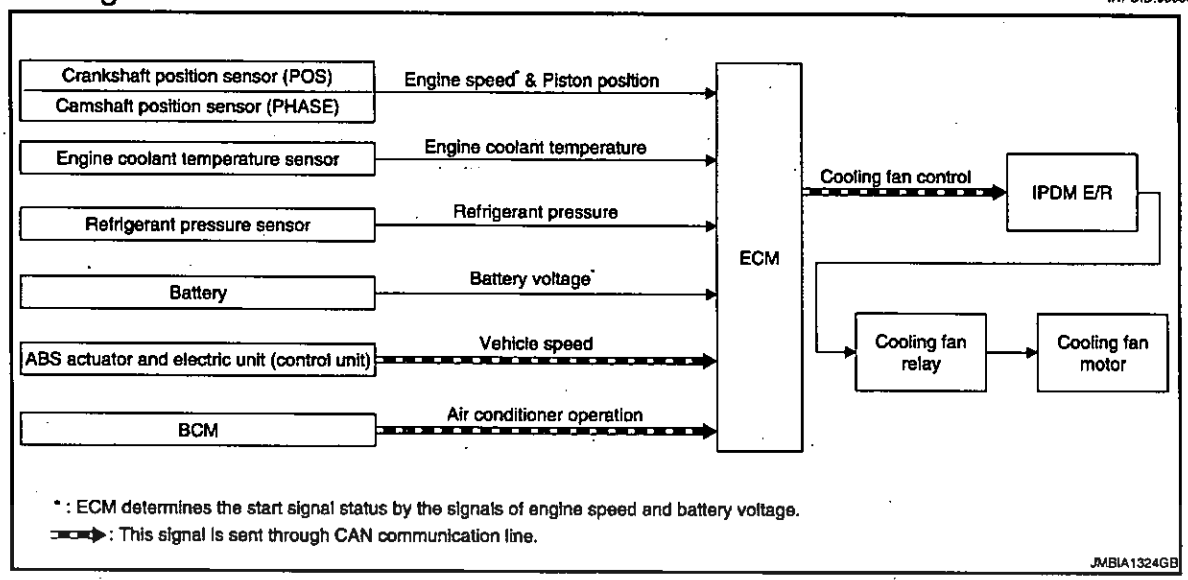
INFOID:0000000004899812

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.
Refer to LAN-21, "CAN Communication Signal Chart", about CAN communication for detail.

# COOLING FAN CONTROL

## System Diagram

INFOID:0000000004899813




## System Description

INFOID:0000000004899814

### INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Crankshaft position sensor (POS)<br>Camshaft position sensor (PHASE) | Engine speed*1<br>Piston position | Cooling fan control | IPDM E/R<br>↓<br>Cooling fan relay<br>↓<br>Cooling fan motor |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Refrigerant pressure sensor | Refrigerant pressure | | |
| Battery | Battery voltage*1 | | |
| ABS actuator and electric unit (control unit) | Vehicle speed*2 | | |
| BCM | Air conditioner operation*2 | | |

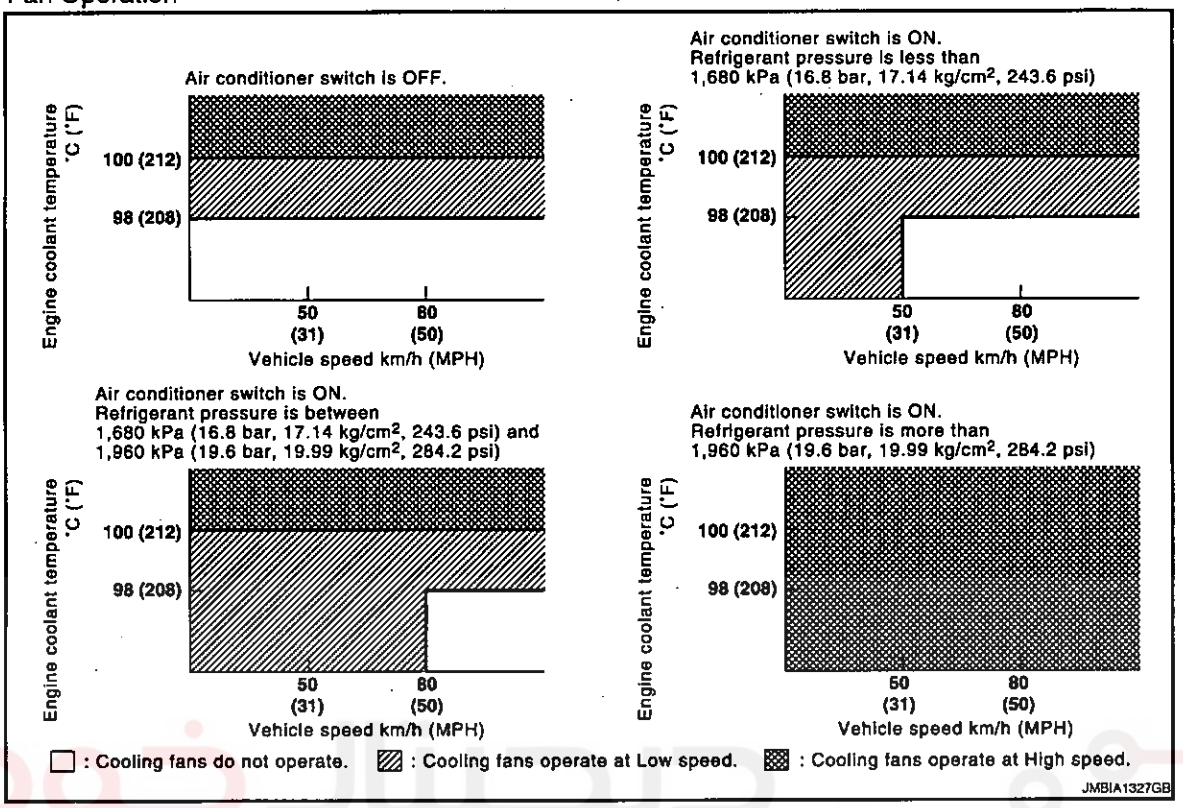
*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to ECM through CAN communication line.

### SYSTEM DESCRIPTION

ECM controls cooling fan speed corresponding to vehicle speed, engine coolant temperature, refrigerant pressure, air conditioner ON signal. Then control system has 3-step control [HIGH/LOW/OFF].

Cooling Fan Operation




Cooling Fan Relay Operation

The ECM controls cooling fan relays through CAN communication line.

| Cooling fan speed | Cooling fan relay | |
|---|---|---|
| | 1 | 3 |
| Stop (OFF) | OFF | OFF |
| Low (LOW) | ON | OFF |
| High (HI) | OFF | ON |

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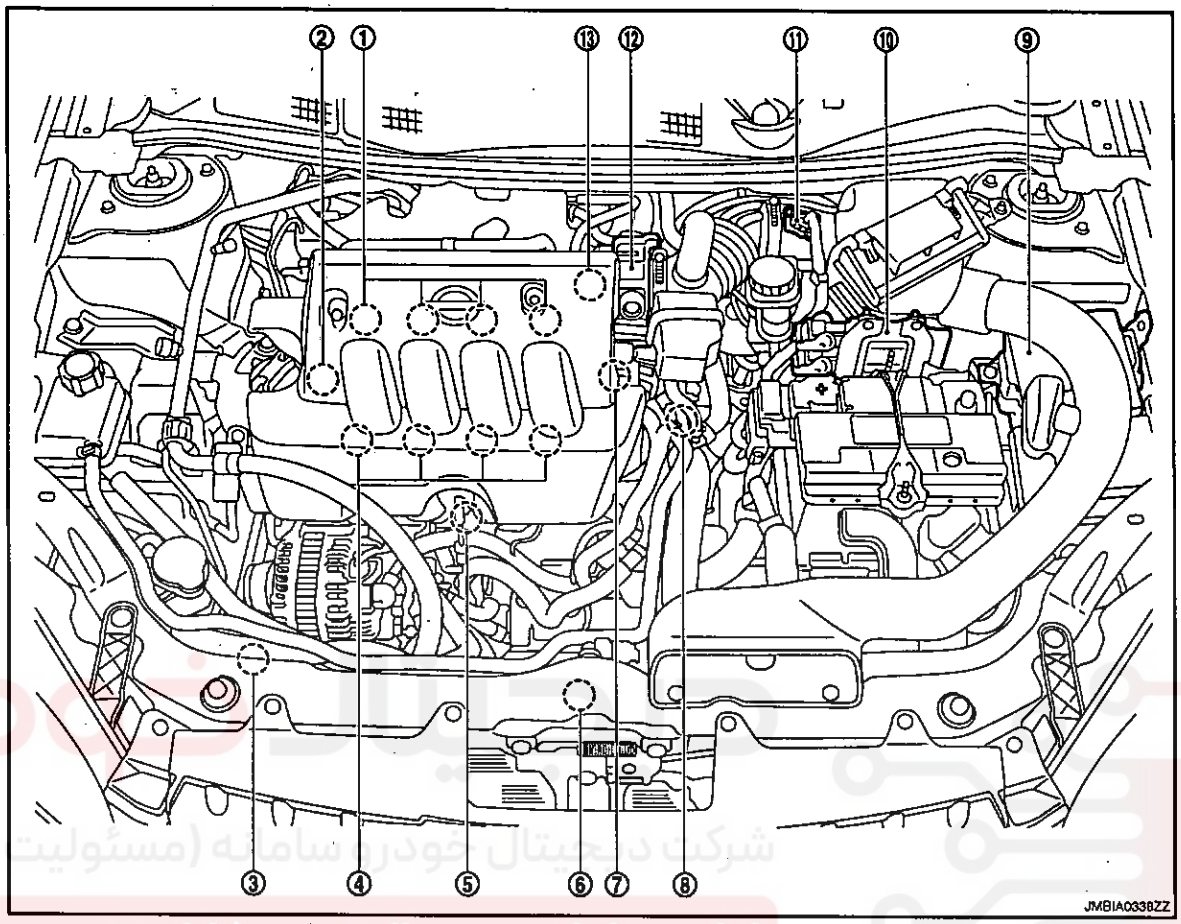
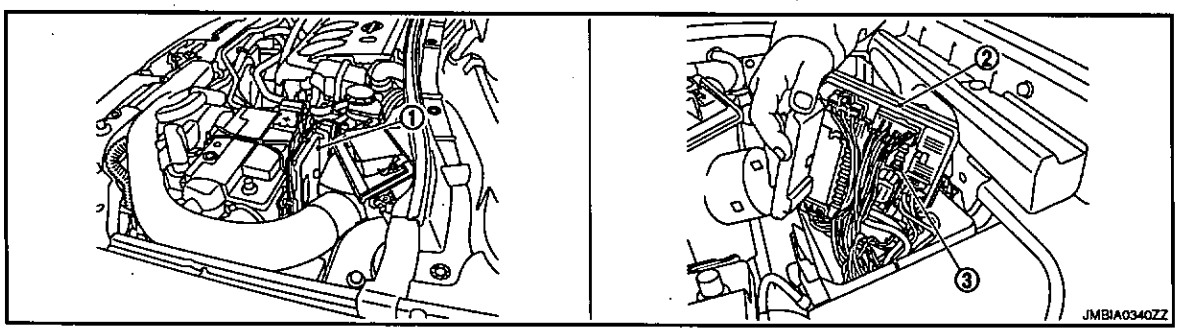
## Component Parts Location

INFOID:0000000004899815




1. Ignition coil (with power transistor) and spark plug
2. PCV valve
3. Refrigerant pressure sensor
4. Fuel injector
5. Knock sensor
6. Cooling fan motor
7. Camshaft position sensor (PHASE)
8. Engine coolant temperature sensor
9. IPDM E/R
10. ECM
11. Mass air flow sensor (with intake air temperature sensor)
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve




1. ECM
2. IPDM E/R
3. Fuel pump fuse (15A)



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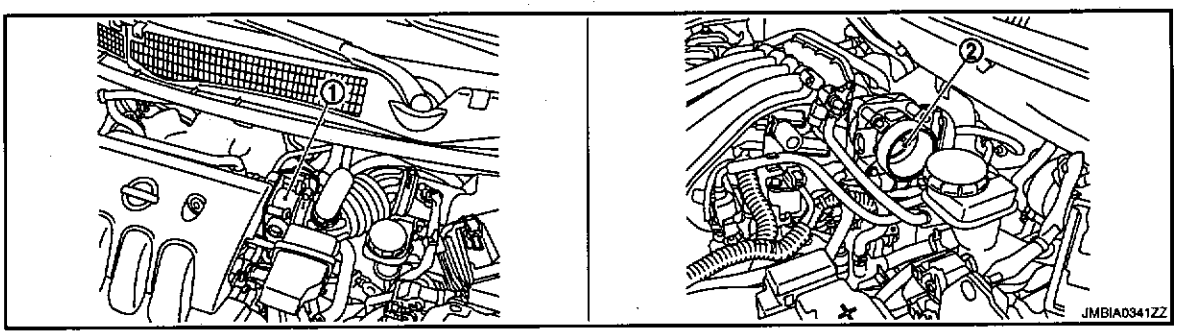
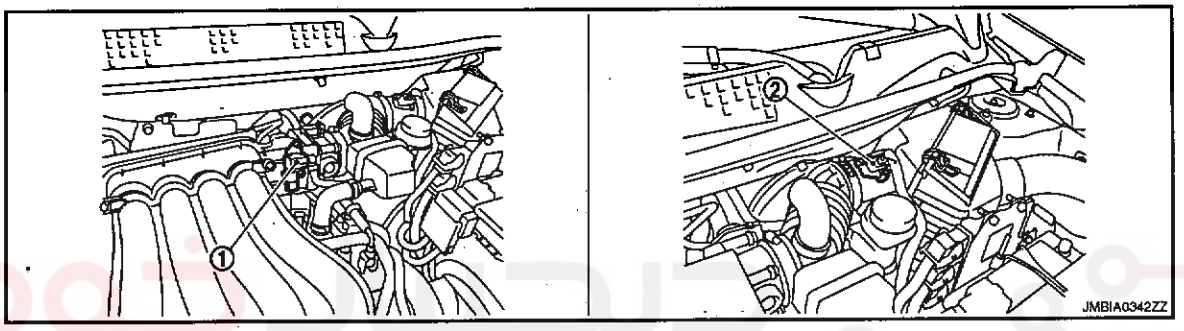
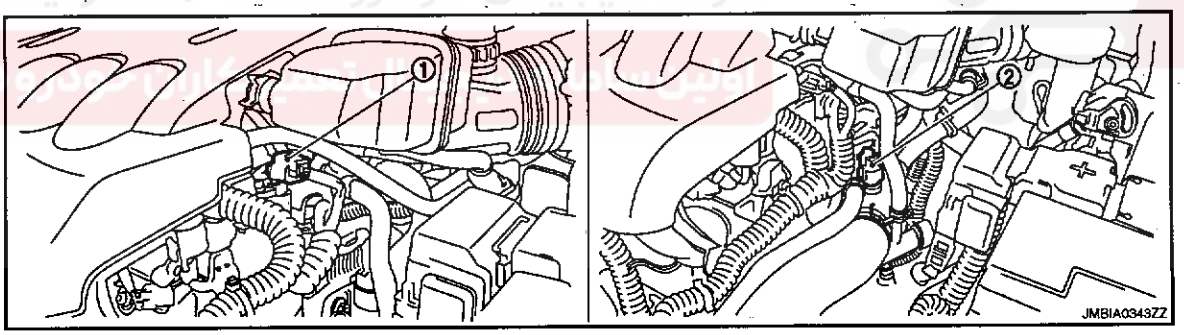


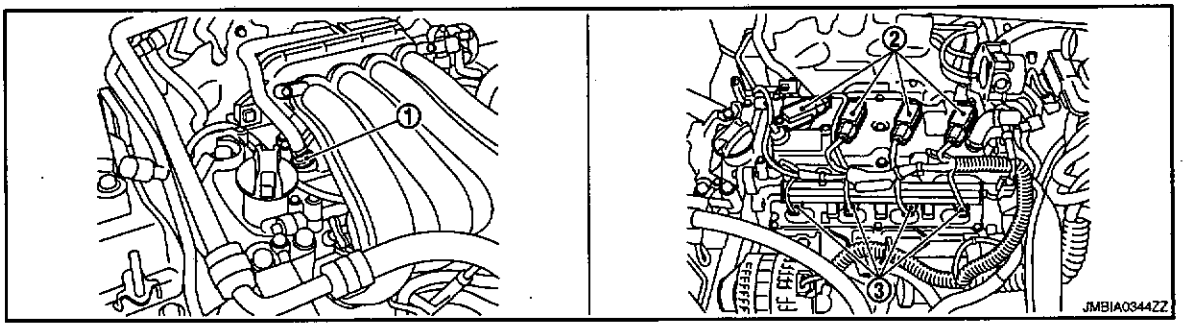

1. Electric throttle control actuator (with built-in position sensor, throttle control motor)
2. Throttle valve



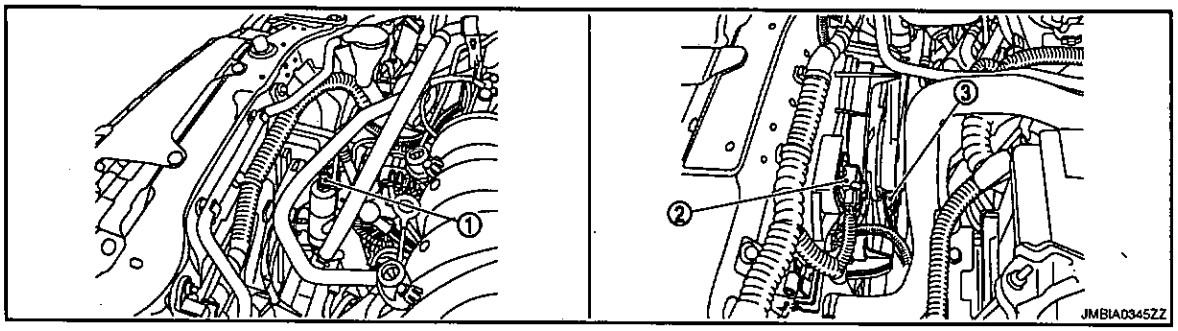

1. EVAP canister purge volume control solenoid valve
2. Mass air flow sensor (with intake air temperature sensor)



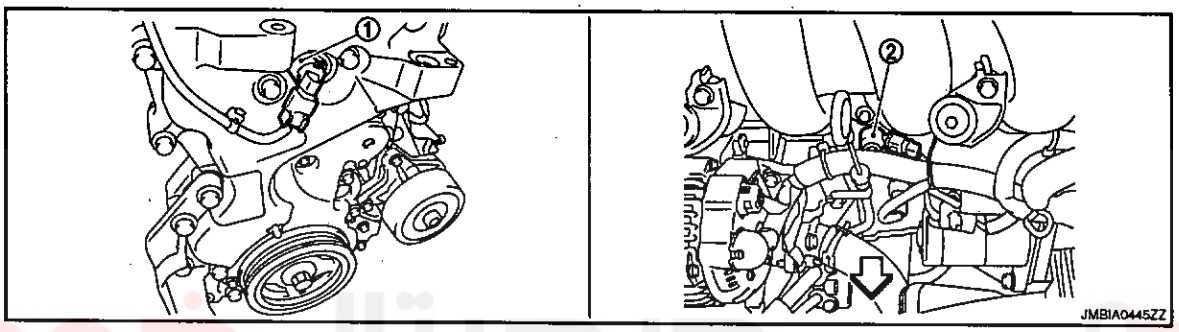

1. Camshaft position sensor (PHASE)
2. Engine coolant temperature sensor




1. PCV valve
2. Ignition coil (with power transistor) and spark plug
3. Fuel injector

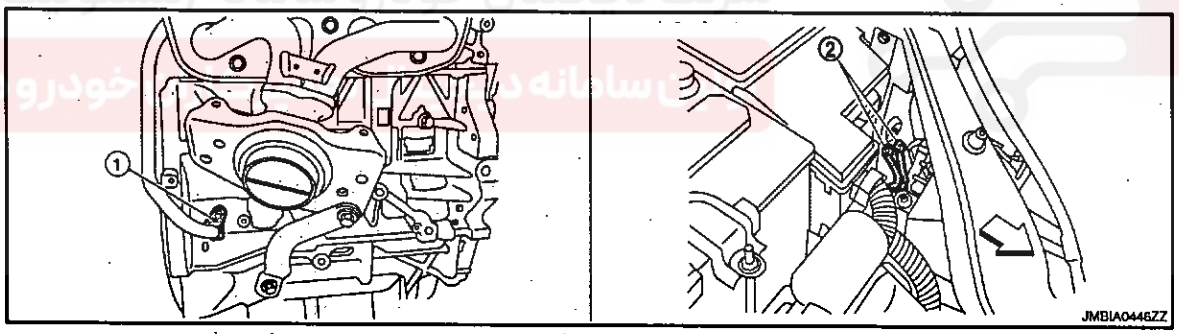



1. Refrigerant pressure sensor 2. Resister 3. Cooling fan motor



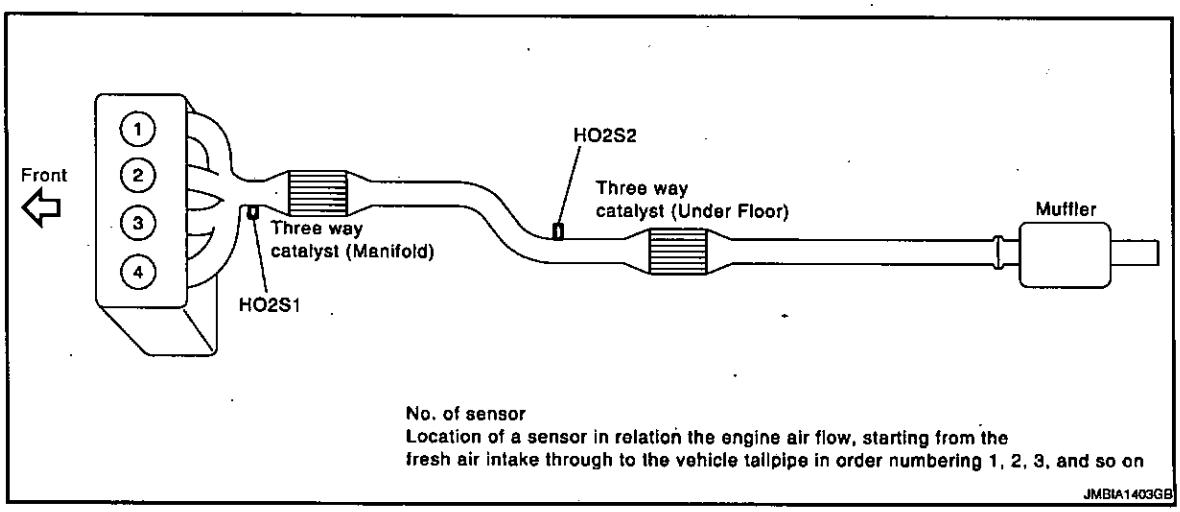

1. Intake valve timing control solenoid valve 2. Knock sensor

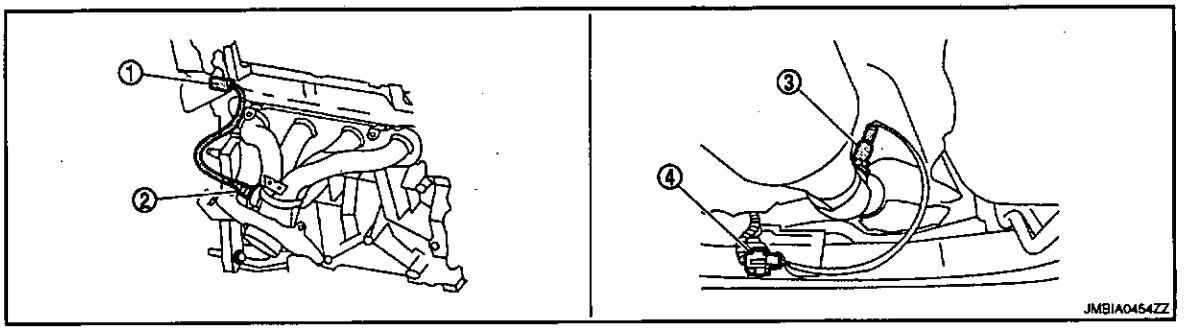
⇦ : Vehicle front



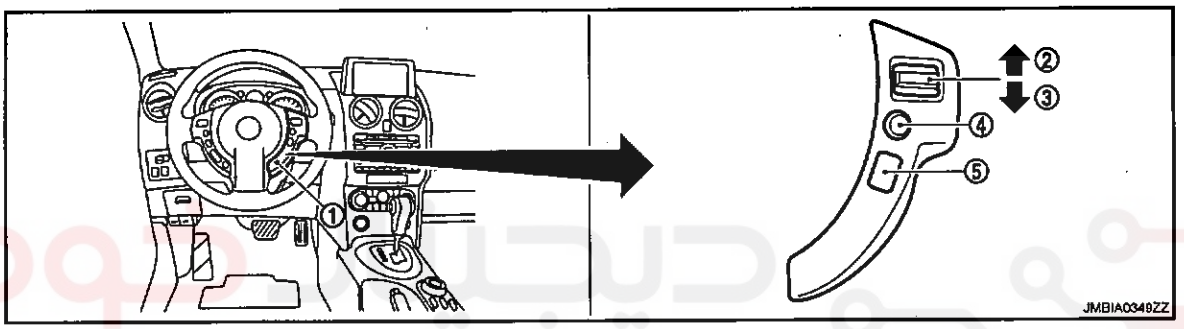

1. Crankshaft position sensor (POS) 2. Ground

⇦ : Vehicle front

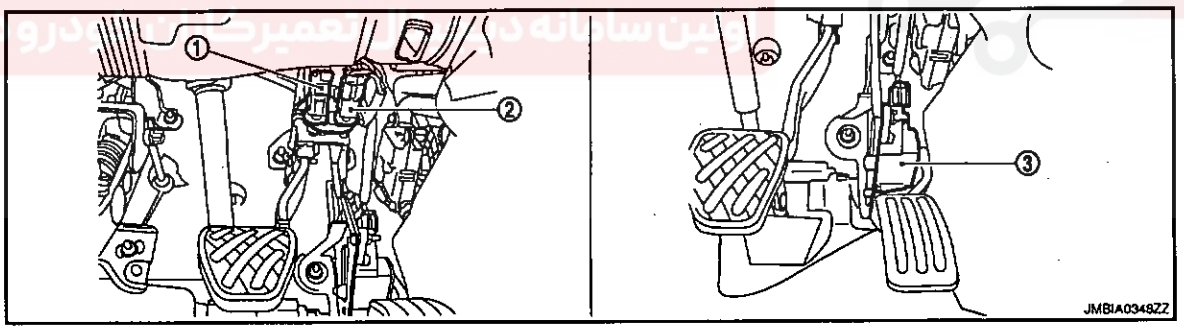




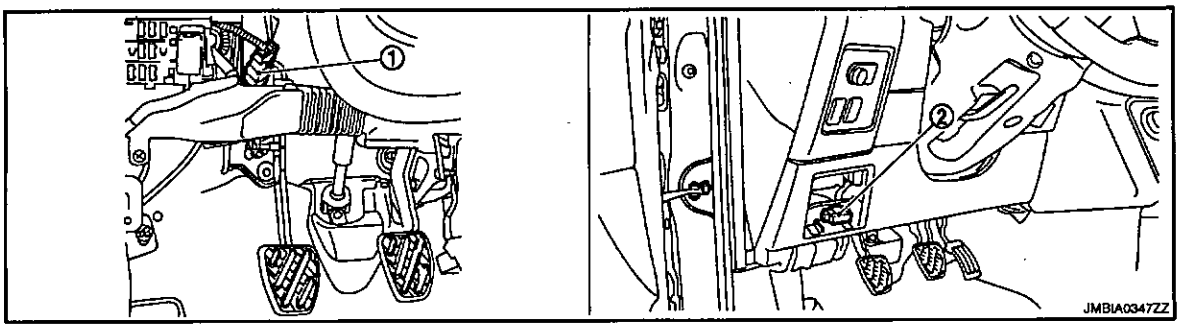

1. Heated oxygen sensor 1 harness connector
2. Heated oxygen sensor 1
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector




1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCCELERATE switch
4. SET/COAST switch
5. MAIN switch




1. Stop lamp switch
2. ASCD brake switch
3. Accelerator pedal position sensor




1. ASCD clutch switch
2. Data link connector

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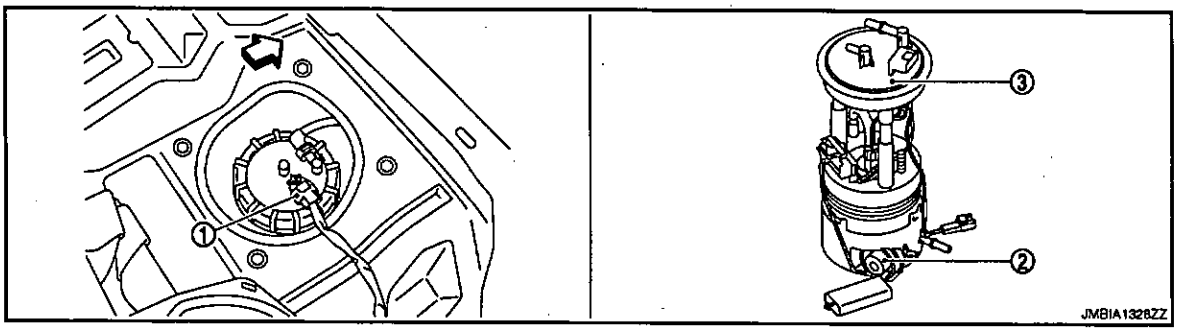


1. Fuel level sensor unit and fuel pump harness connector
2. Fuel pressure regulator
3. Fuel level sensor unit and fuel pump

⇦ : Vehicle front

## Component Description

INFOID:0000000004899816

| Component | Reference |
|---|---|
| Camshaft position sensor (PHASE) | EC-151, "Description" |
| Crankshaft position sensor (POS) | EC-147, "Description" |
| Cooling fan motor | EC-240, "Description" |
| Engine coolant temperature sensor | EC-99, "Description" |
| Refrigerant pressure sensor | EC-256, "Description" |





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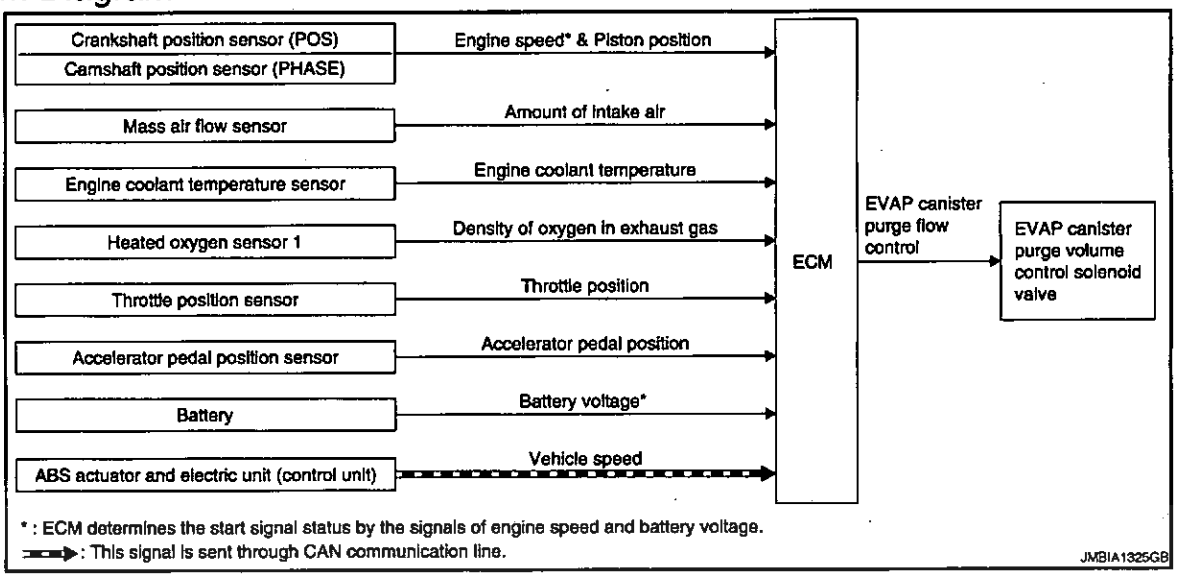
# EVAPORATIVE EMISSION SYSTEM

## System Diagram

INFOID:0000000004899817




## System Description

INFOID:0000000004899818

### INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Crankshaft position sensor (POS) | Engine speed*1 Piston position | EVAP canister purge flow control | EVAP canister purge volume control solenoid valve |
| Camshaft position sensor (PHASE) | | | |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Heated oxygen sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Battery | Battery voltage*1 | | |
| ABS actuator and electric unit (control unit) | Vehicle speed*2 | | |

*1: ECM determines the start signal status by the signals of engine speed and battery voltage.
*2: This signal is sent to the ECM through CAN communication line.

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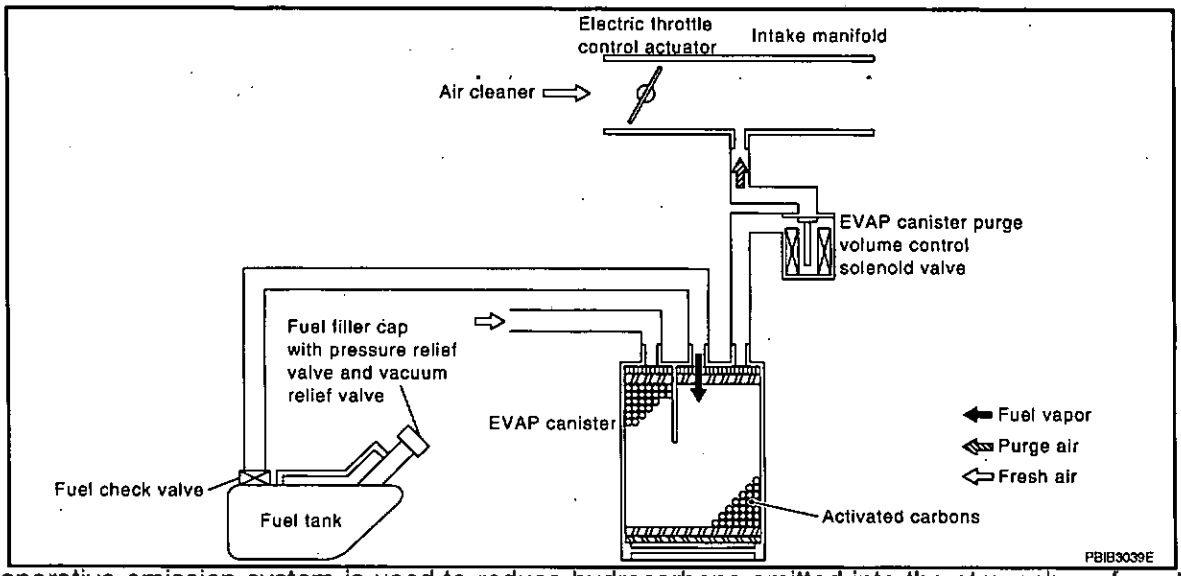
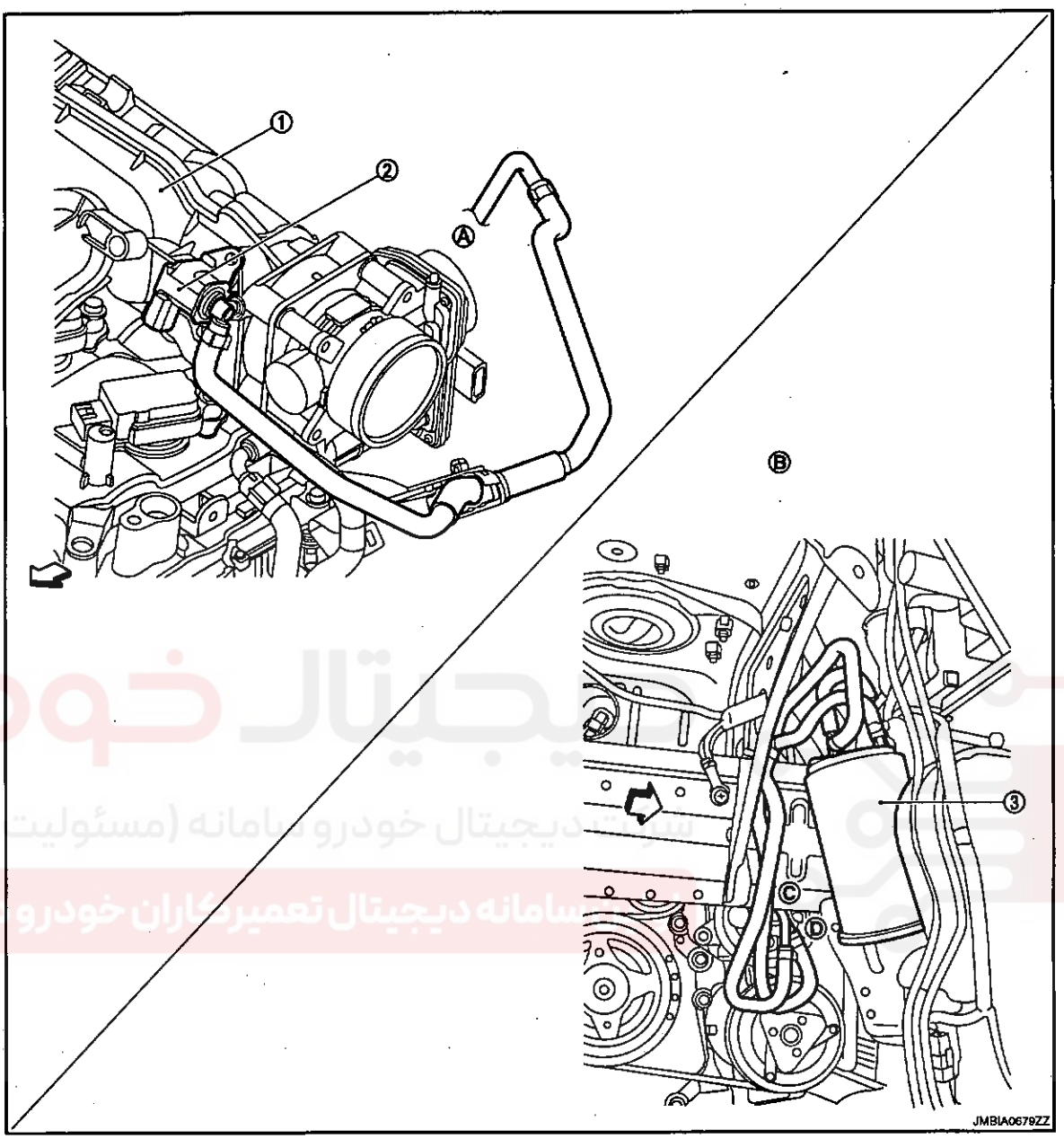
## SYSTEM DESCRIPTION




The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

## EVAPORATIVE EMISSION LINE DRAWING




1. Intake manifold
2. EVAP canister purge volume control solenoid valve
3. EVAP canister
A. From EVAP canister
B. View with front fender protector RH removed
C. From fuel tank
D. From EVAP canister purge volume control solenoid valve
⇦ : Vehicle front

**NOTE:**
Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

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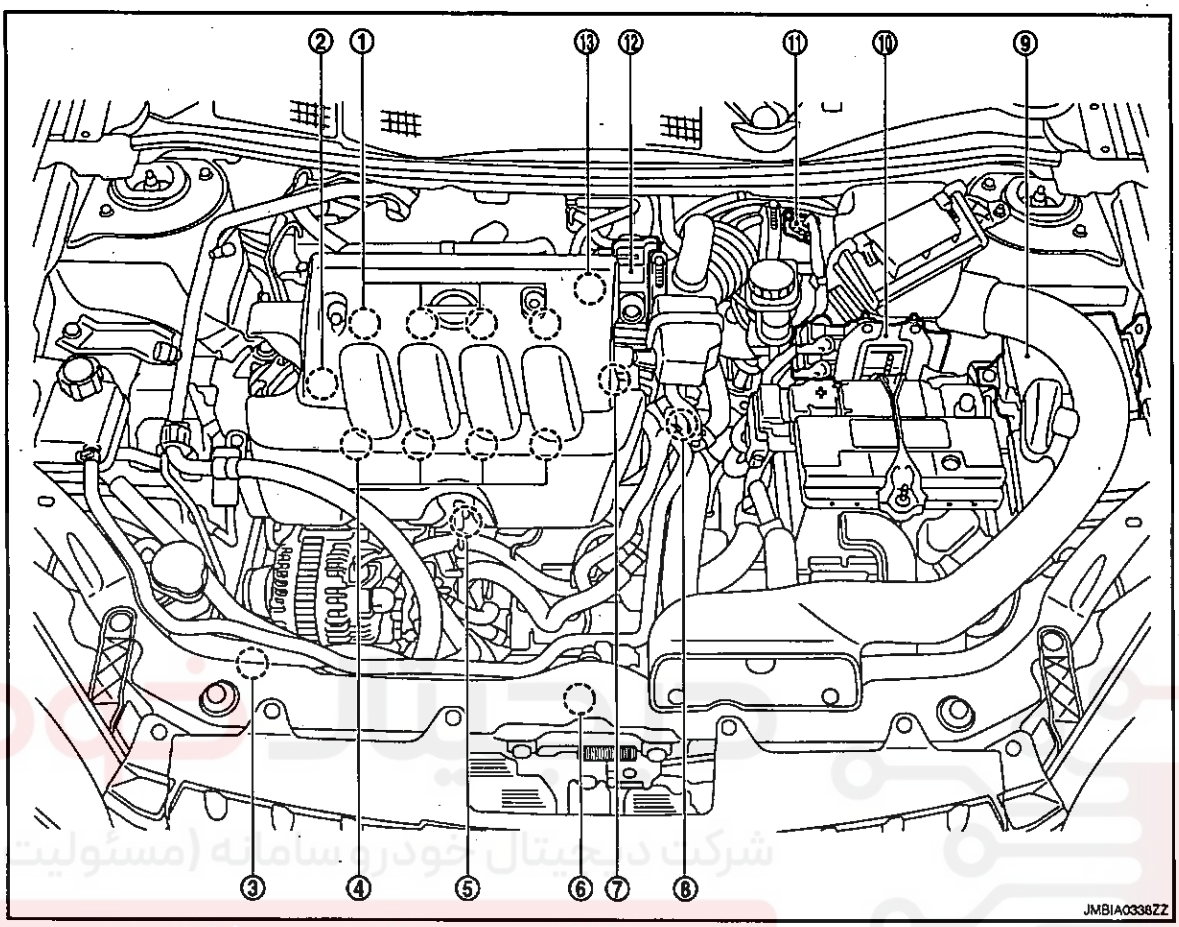
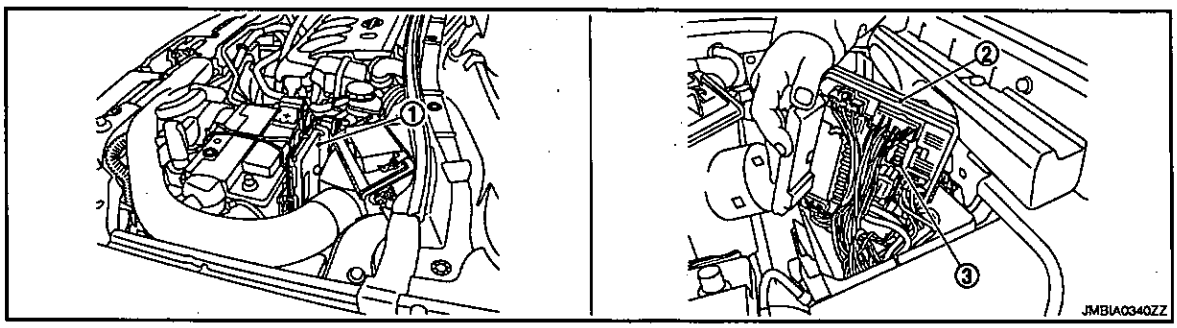
## Component Parts Location

INFOID:0000000004899819




1. Ignition coil (with power transistor) and spark plug
2. PCV valve
3. Refrigerant pressure sensor
4. Fuel injector
5. Knock sensor
6. Cooling fan motor
7. Camshaft position sensor (PHASE)
8. Engine coolant temperature sensor
9. IPDM E/R
10. ECM
11. Mass air flow sensor (with intake air temperature sensor)
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve




1. ECM
2. IPDM E/R
3. Fuel pump fuse (15A)



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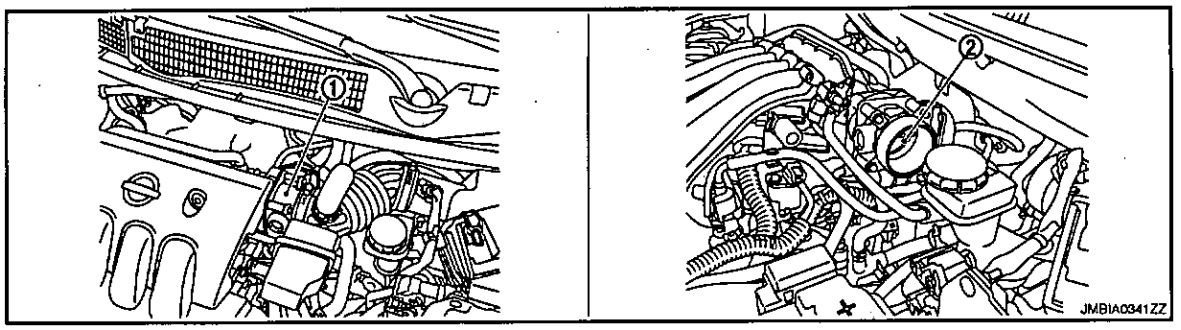
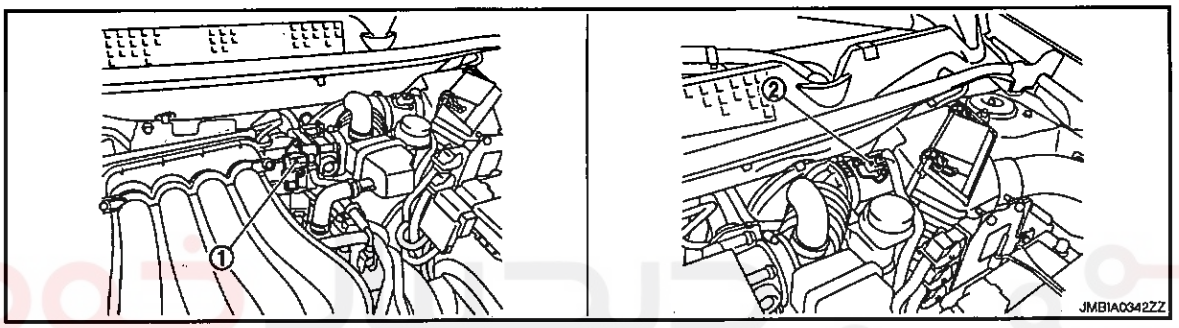
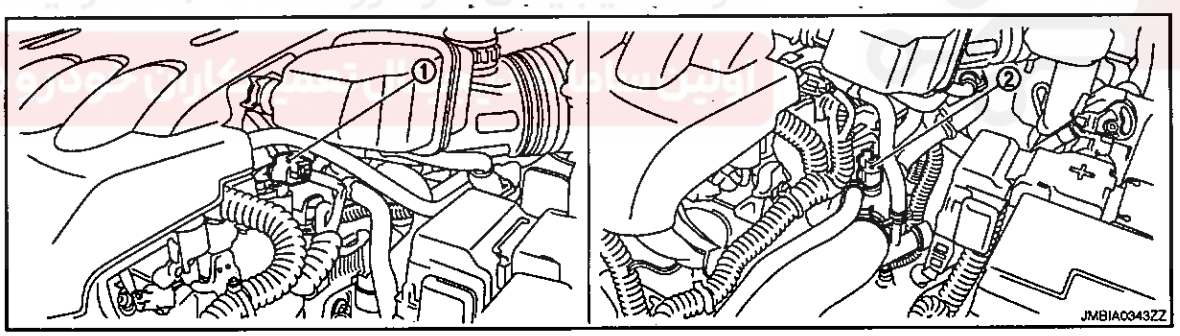


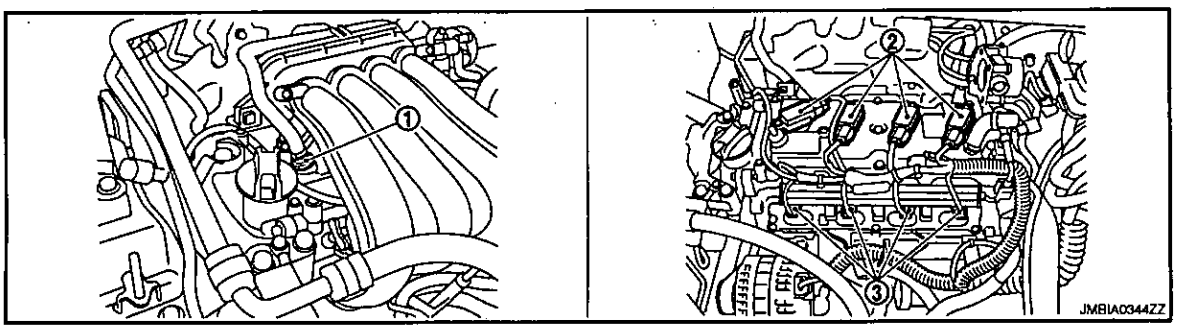

1. Electric throttle control actuator (with built-in position sensor, throttle control motor)
2. Throttle valve



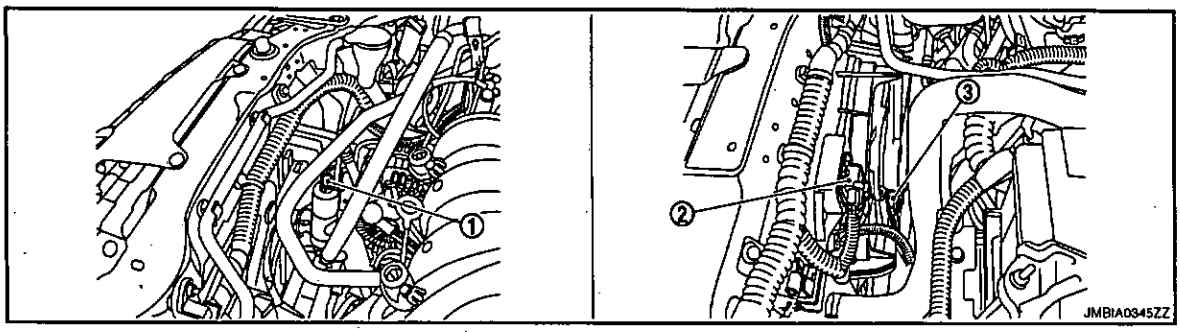

1. EVAP canister purge volume control solenoid valve
2. Mass air flow sensor (with intake air temperature sensor)



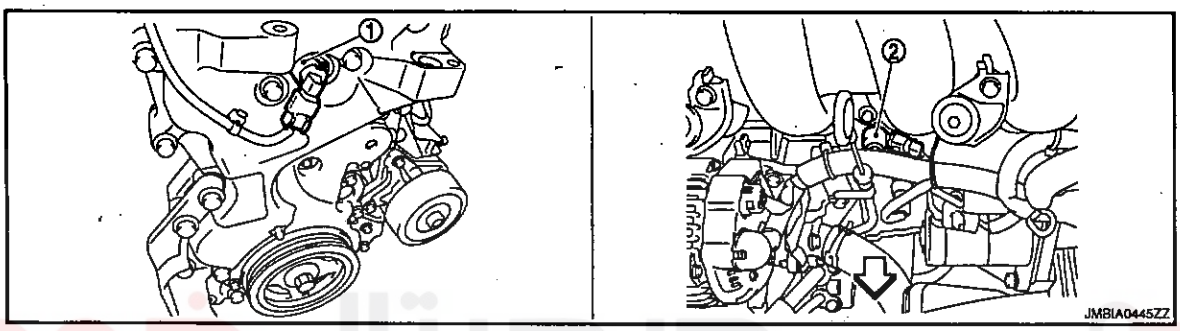

1. Camshaft position sensor (PHASE)
2. Engine coolant temperature sensor




1. PCV valve
2. Ignition coil (with power transistor) and spark plug
3. Fuel injector

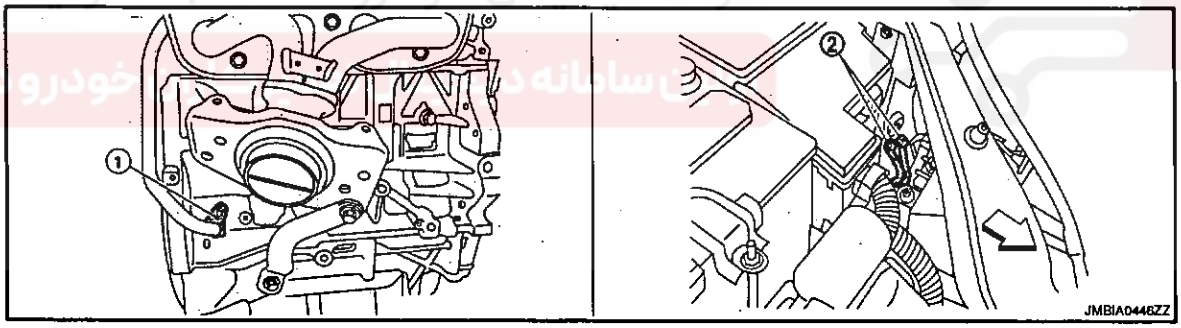



1. Refrigerant pressure sensor 2. Resister 3. Cooling fan motor



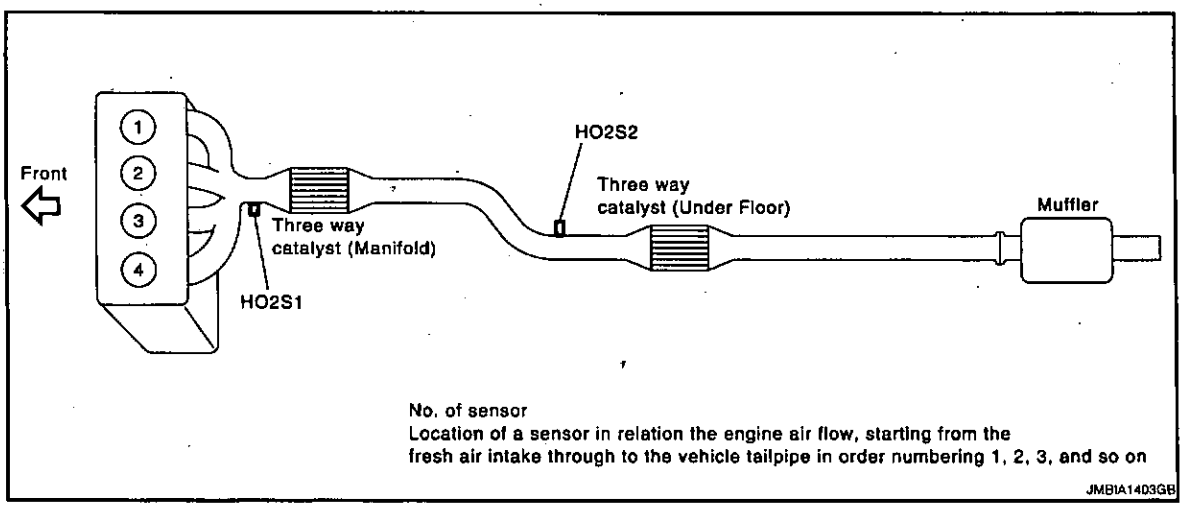

1. Intake valve timing control solenoid valve 2. Knock sensor

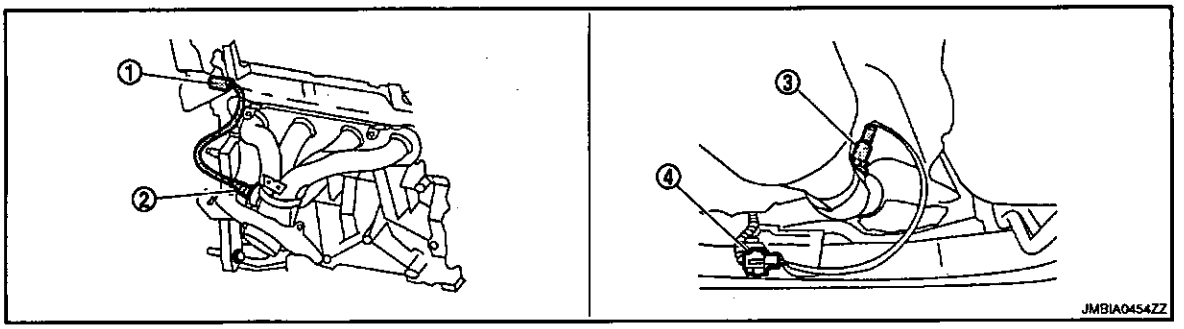
⇦ : Vehicle front



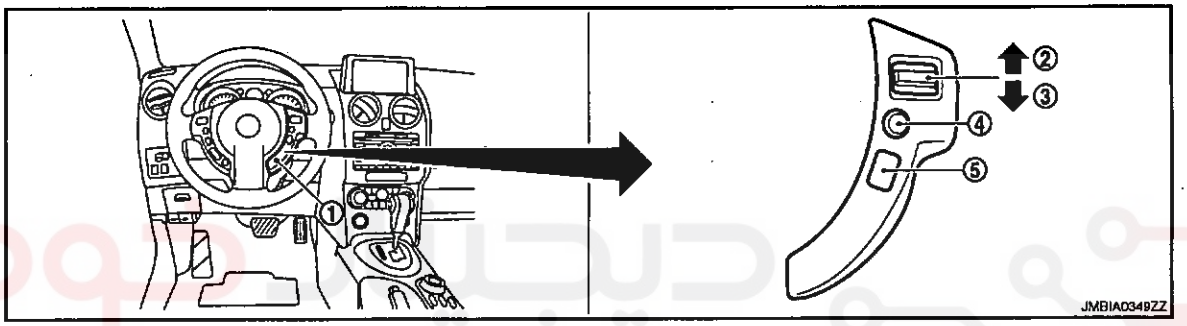

1. Crankshaft position sensor (POS) 2. Ground

⇦ : Vehicle front

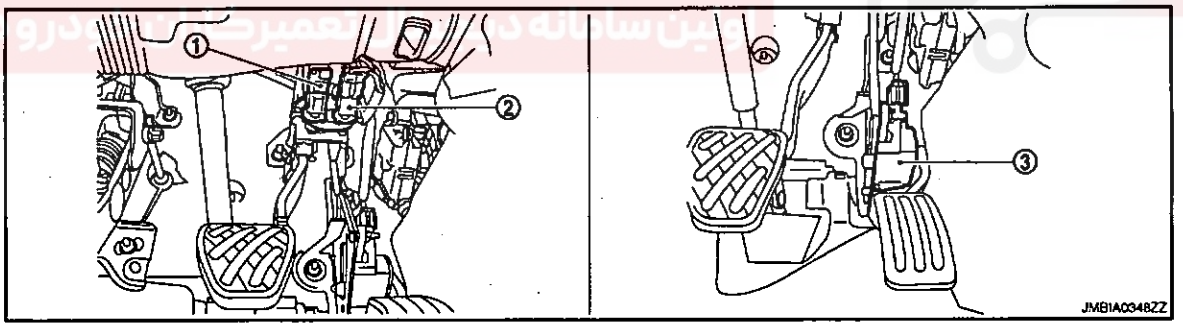




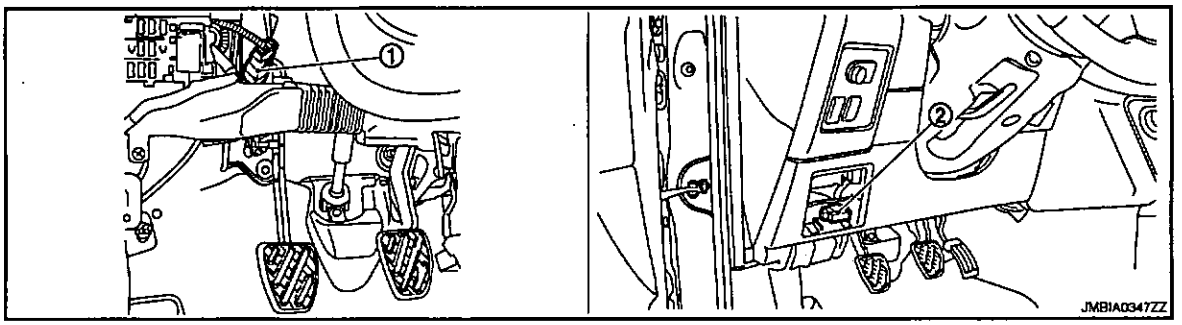

1. Heated oxygen sensor 1 harness connector
2. Heated oxygen sensor 1
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector




1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCCELERATE switch
4. SET/COAST switch
5. MAIN switch




1. Stop lamp switch
2. ASCD brake switch
3. Accelerator pedal position sensor




1. ASCD clutch switch
2. Data link connector

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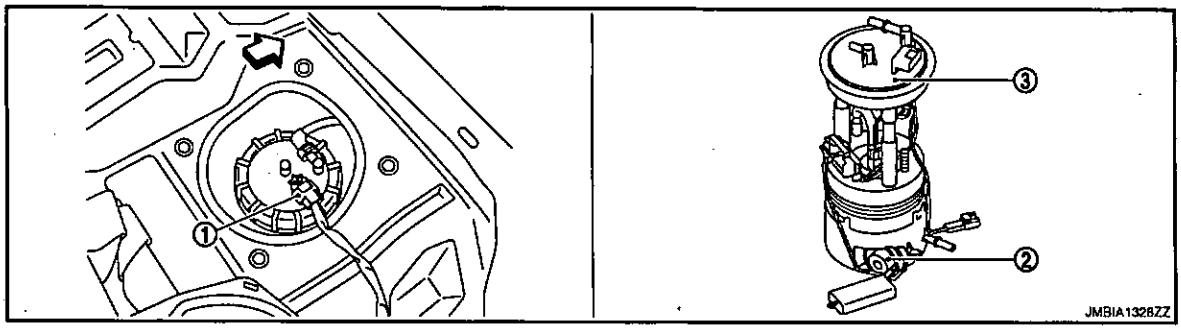


1. Fuel level sensor unit and fuel pump harness connector
2. Fuel pressure regulator
3. Fuel level sensor unit and fuel pump

⇦ : Vehicle front

## Component Description

INFOID:0000000004899820

| Component | Reference |
|---|---|
| Accelerator pedal position sensor | EC-221, "Description" |
| Camshaft position sensor (PHASE) | EC-151, "Description" |
| Crankshaft position sensor (POS) | EC-147, "Description" |
| Engine coolant temperature sensor | EC-99, "Description" |
| EVAP canister purge volume control solenoid valve | EC-159, "Description" |
| Heated oxygen sensor 1 | EC-105, "Description" |
| Mass air flow sensor | EC-92, "Description" |
| Throttle position sensor | EC-102, "Description" |





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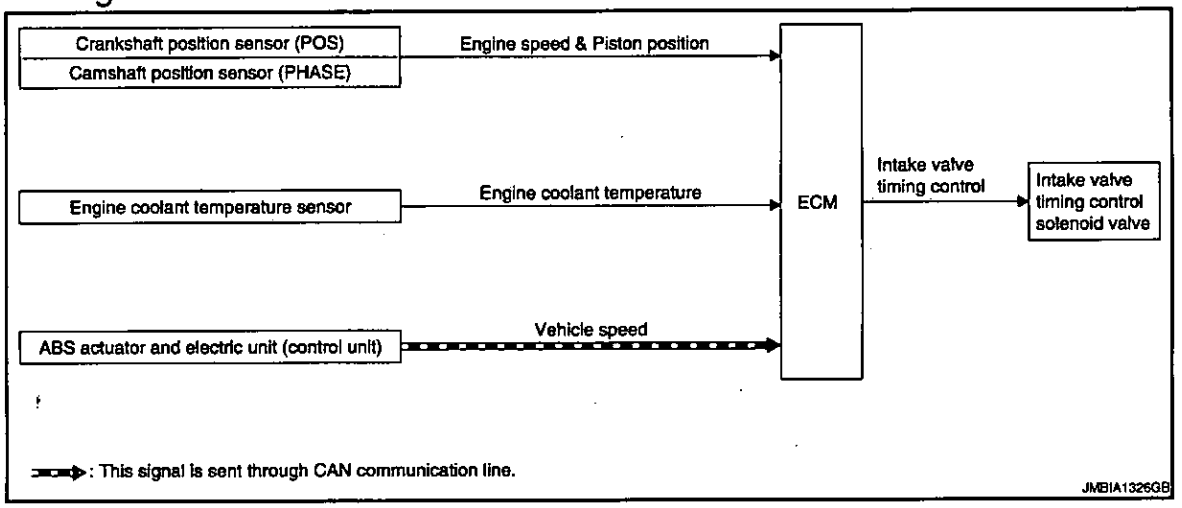
# INTAKE VALVE TIMING CONTROL

## System Diagram

INFOID:0000000004899821




## System Description

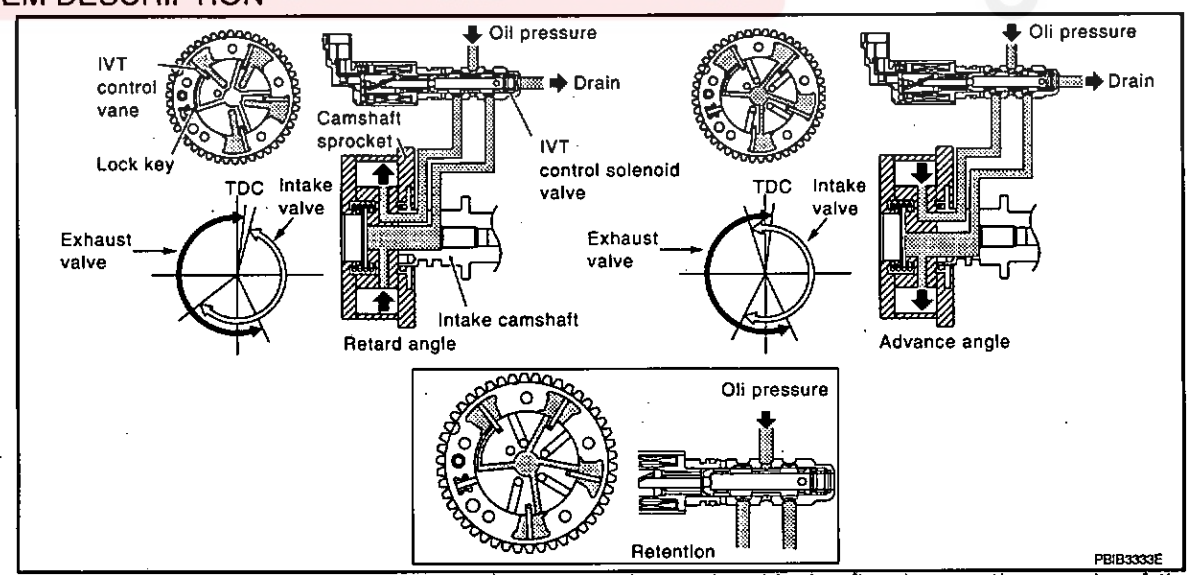
INFOID:0000000004899822

### INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Crankshaft position sensor (POS) | Engine speed<br>Piston position | Intake valve timing control | Intake valve timing control solenoid valve |
| Camshaft position sensor (PHASE) | | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| ABS actuator and electric unit (control unit) | Vehicle speed* | | |

*: This signal is sent to the ECM through CAN communication line

### SYSTEM DESCRIPTION




This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing (IVT) control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

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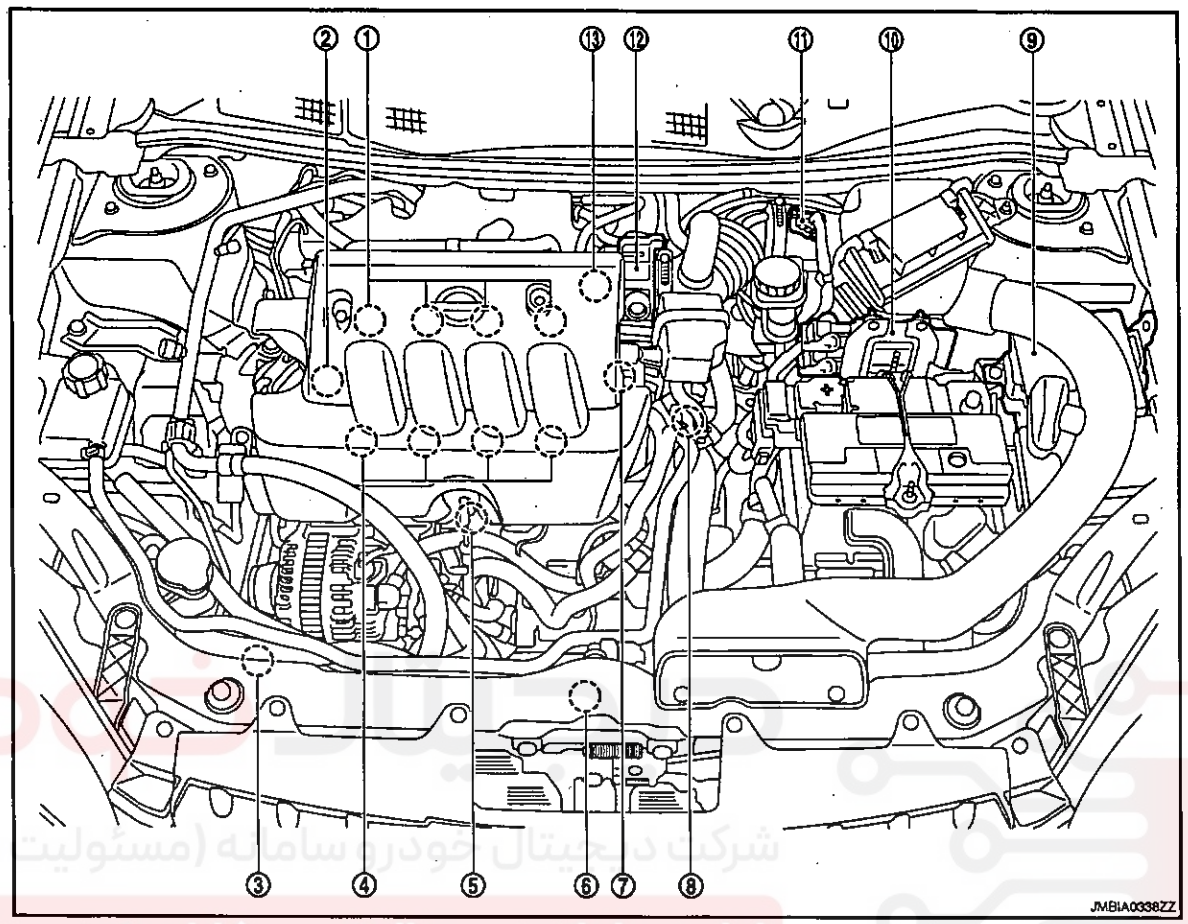
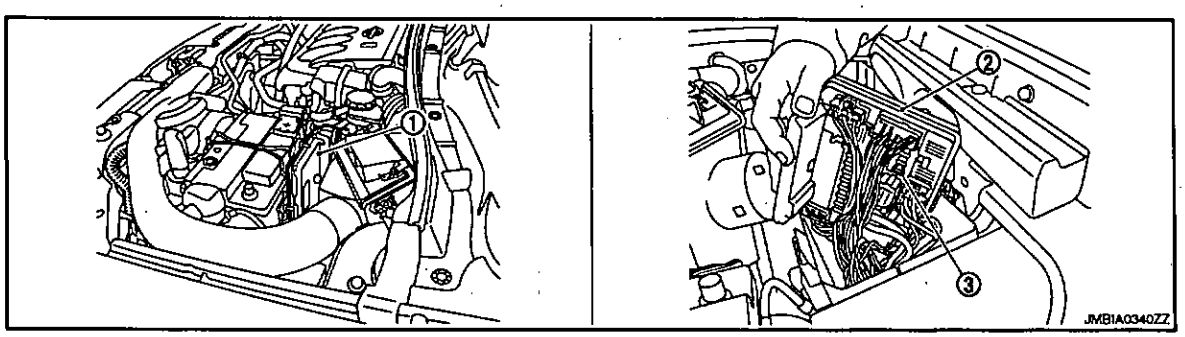
## Component Parts Location

INFOID:0000000004899823




1. Ignition coil (with power transistor) and spark plug
2. PCV valve
3. Refrigerant pressure sensor
4. Fuel injector
5. Knock sensor
6. Cooling fan motor
7. Camshaft position sensor (PHASE)
8. Engine coolant temperature sensor
9. IPDM E/R
10. ECM
11. Mass air flow sensor (with intake air temperature sensor)
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve




1. ECM
2. IPDM E/R
3. Fuel pump fuse (15A)



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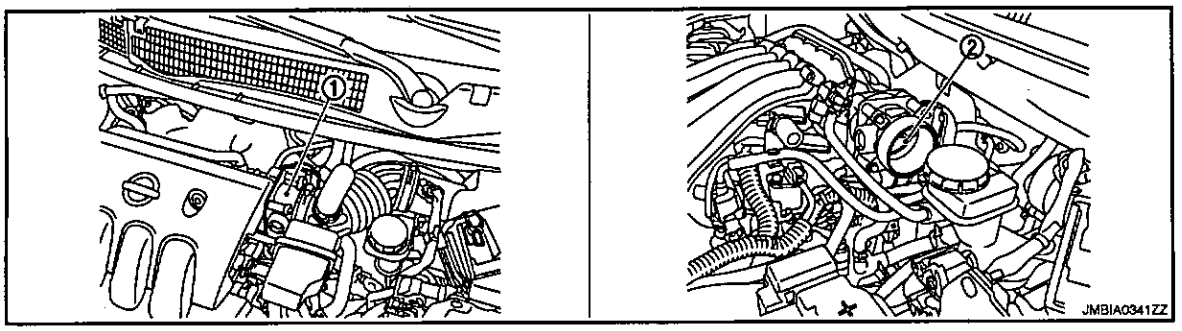
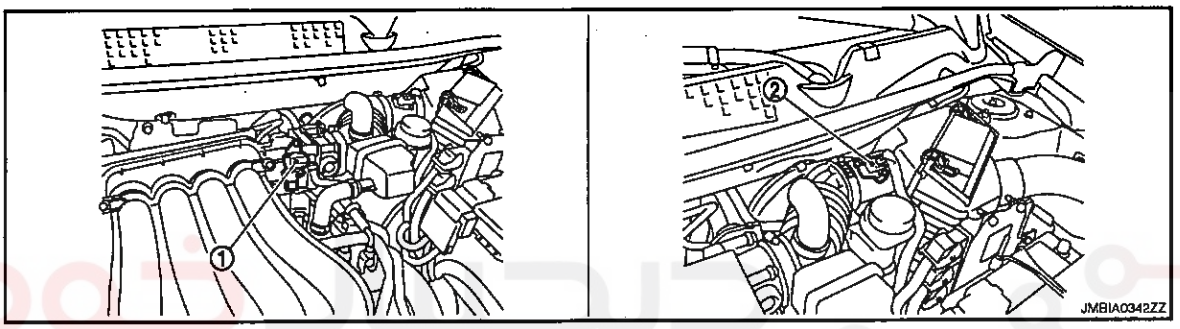
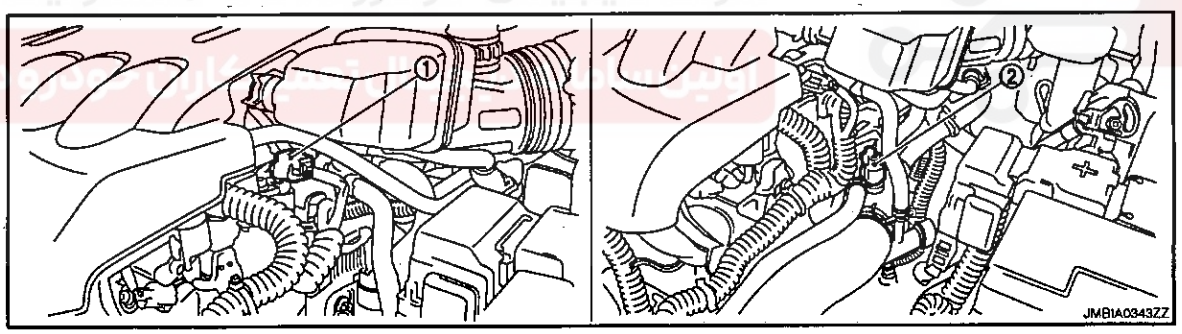


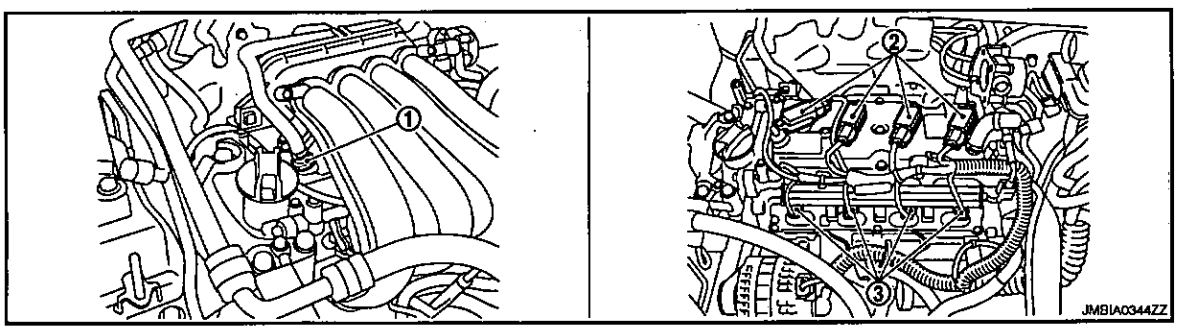

1. Electric throttle control actuator (with built-in position sensor, throttle control motor)
2. Throttle valve



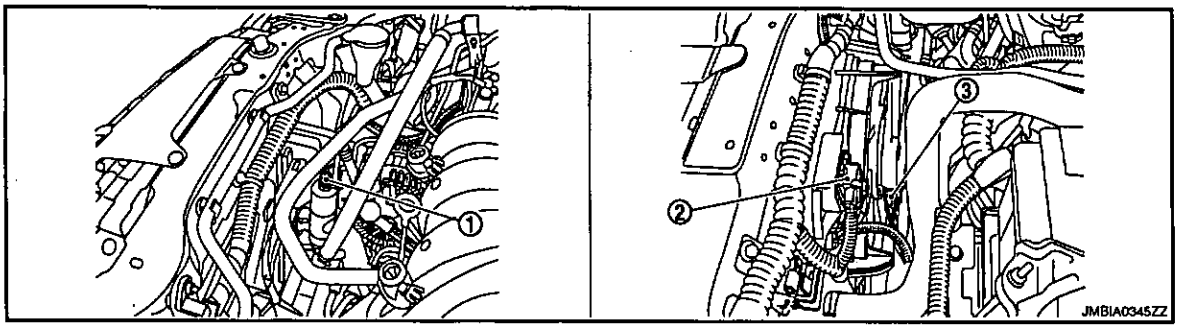

1. EVAP canister purge volume control solenoid valve
2. Mass air flow sensor (with intake air temperature sensor)



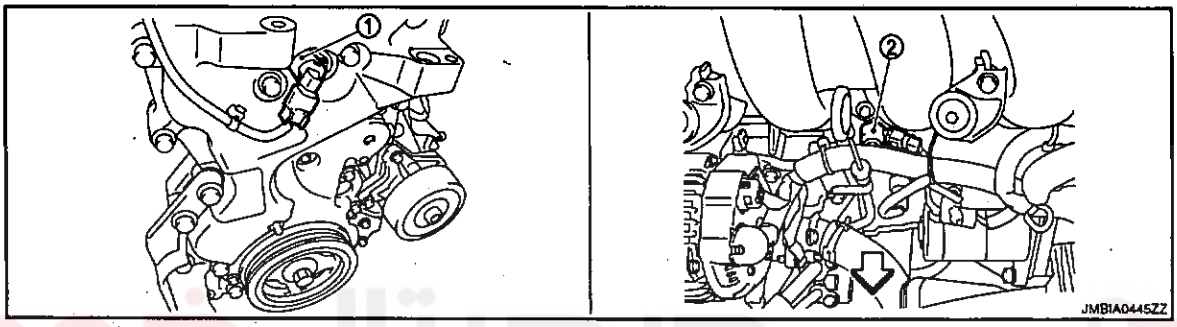

1. Camshaft position sensor (PHASE)
2. Engine coolant temperature sensor




1. PCV valve
2. Ignition coil (with power transistor) and spark plug
3. Fuel injector

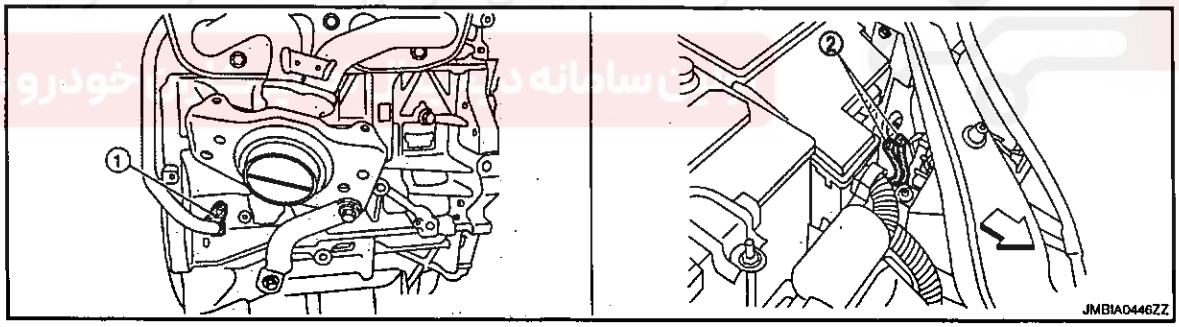



1. Refrigerant pressure sensor 2. Resister 3. Cooling fan motor



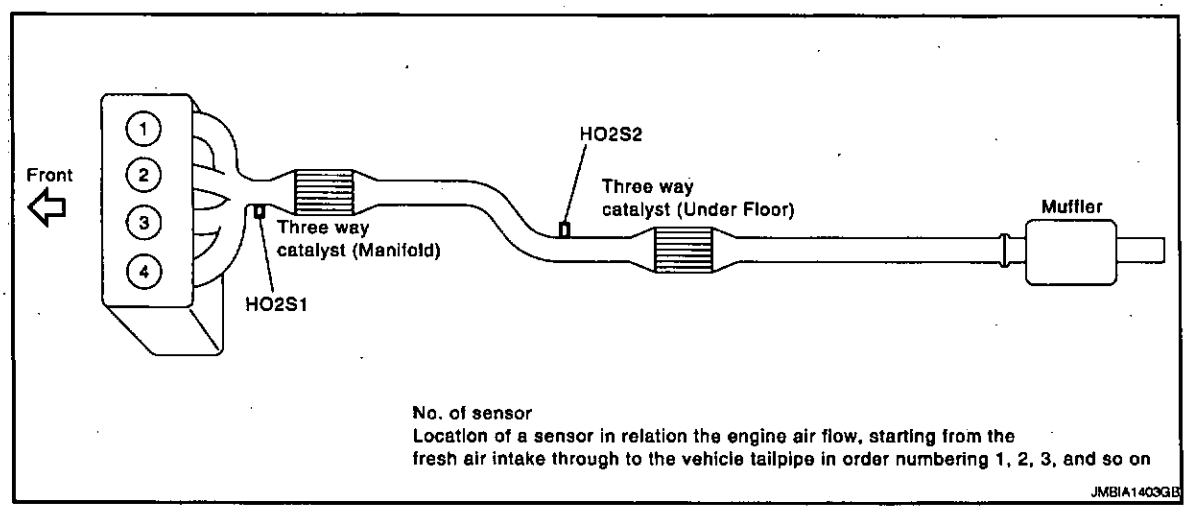

1. Intake valve timing control solenoid valve 2. Knock sensor

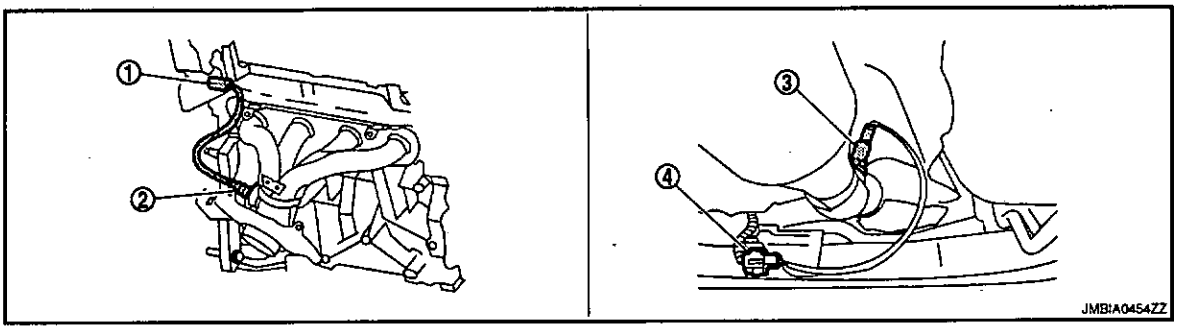
⇦ : Vehicle front



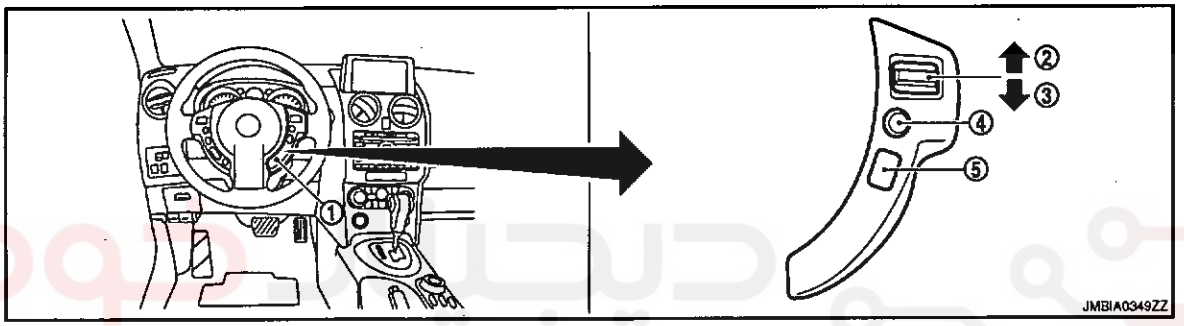

1. Crankshaft position sensor (POS) 2. Ground

⇦ : Vehicle front

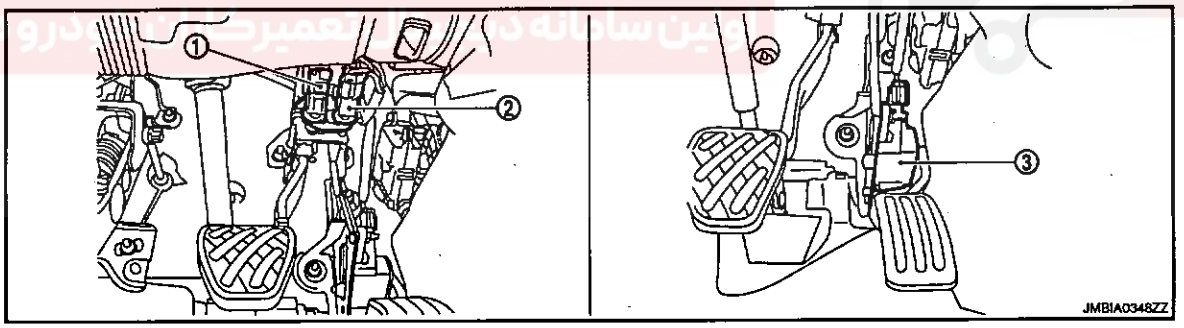




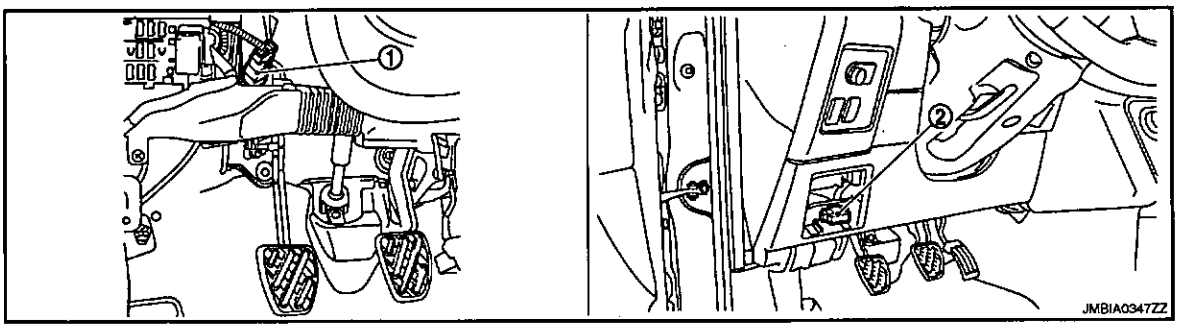

1. Heated oxygen sensor 1 harness connector
2. Heated oxygen sensor 1
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector



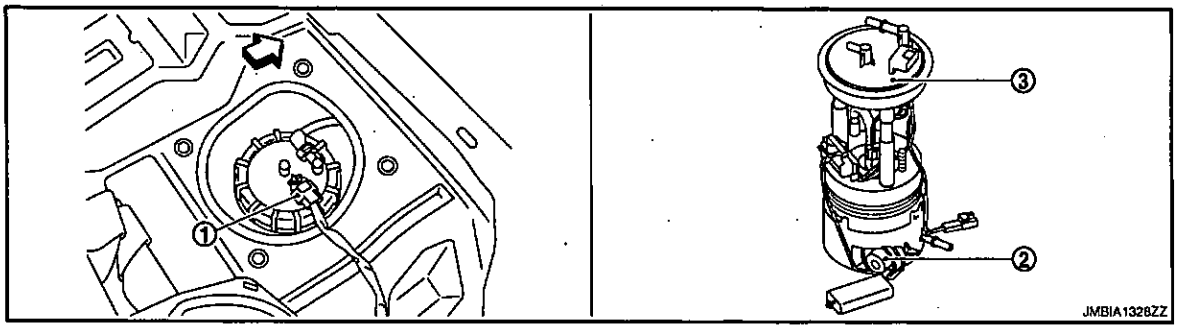

1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCCELERATE switch
4. SET/COAST switch
5. MAIN switch




1. Stop lamp switch
2. ASCD brake switch
3. Accelerator pedal position sensor




1. ASCD clutch switch
2. Data link connector




1. Fuel level sensor unit and fuel pump harness connector
2. Fuel pressure regulator
3. Fuel level sensor unit and fuel pump

⇦ : Vehicle front

## Component Description

INFOID:0000000004899624

| Component | Reference |
|---|---|
| Camshaft position sensor (PHASE) | EC-151, "Description" |
| Crankshaft position sensor (POS) | EC-147, "Description" |
| Engine coolant temperature sensor | EC-99, "Description" |
| Intake valve timing control solenoid valve | EC-164, "Description" |

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# ON BOARD DIAGNOSTIC (OBD) SYSTEM

## Diagnosis Description

INFOID:0000000004899825

### INTRODUCTION

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

| Emission-related diagnostic information | Diagnostic service |
|---|---|
| Diagnostic Trouble Code (DTC) | Service $03 of ISO 15031-5 |
| Freeze Frame data | Service $02 of ISO 15031-5 |
| System Readiness Test (SRT) code | Service $01 of ISO 15031-5 |
| 1st Trip Diagnostic Trouble Code (1st Trip DTC) | Service $07 of ISO 15031-5 |
| Test values and Test limits | Service $06 of ISO 15031-5 |
| Calibration ID | Service $09 of ISO 15031-5 |

The above information can be checked using procedures listed in the table below.

×: Applicable —: Not applicable

| | DTC | 1st trip DTC | Freeze Frame data | SRT code | Test value |
|---|---|---|---|---|---|
| GST | × | × | × | × | × |
| ECM | × | ×* | — | — | — |

*: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator (MIL) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-269, "Fail Safe".)

### TWO TRIP DETECTION LOGIC

When a malfunction is detected for the first time, 1st trip DTC is stored in the ECM memory. The MIL will not light up at this stage. <1st trip>

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL lights up. The MIL lights up at the same time when the DTC is stored. <2nd trip> The "trip" in the "Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

| Items | MIL | | | | DTC | | 1st trip DTC | |
|---|---|---|---|---|---|---|---|---|
| | 1st trip | | 2nd trip | | 1st trip displaying | 2nd trip displaying | 1st trip displaying | 2nd trip displaying |
| | Blinking | Lighting up | Blinking | Lighting up | | | | |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected | × | — | — | — | — | — | × | — |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected | — | — | × | — | — | × | — | — |
| One trip detection diagnoses (Refer to EC-272, "DTC Index".) | — | × | — | — | × | — | — | — |
| Except above | — | — | — | × | — | × | × | — |

### DTC AND FREEZE FRAME DATA

DTC and 1st Trip DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.



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If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".
For malfunctions in which 1st trip DTCs are displayed, refer to "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS". These items are required by legal regulations to continuously monitor the system/component.
1st trip DTC is specified in Service $07 of ISO 15031-5. 1st trip DTC detection occurs without lighting up the MIL and therefore does not warn the driver of a malfunction. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to EC-6, "Work Flow". Then perform DTC CONFIRMATION PROCEDURE or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

Freeze Frame Data
The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, absolute throttle position, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC. The data, stored together with the DTC data, are called freeze frame data and displayed on GST.
Only one set of freeze frame data can be stored in the ECM. It is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

| Priority | Items | |
|---|---|---|
| 1 | Freeze frame data | Misfire — DTC: P0300 - P0304<br>Fuel Injection System Function — DTC: P0171, P0172 |
| 2 | | Except the above items (Includes CVT related items) |

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. However, once freeze frame data is stored in the ECM memory. If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.
Both freeze frame data (along with the DTCs) is cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".

How to Read DTC and 1st Trip DTC

**With GST**
GST (Generic Scan Tool) Examples: P0340, P1148, P1706, etc.
These DTCs are prescribed by ISO 15031-6.

**No Tools**
The number of blinks of the MIL in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC.
Example: 0340, 1148, 1706, etc.
These DTCs are controlled by NISSAN.
- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, GST or the Diagnostic Test Mode II do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal.**

How to Erase DTC and 1st Trip DTC

**With GST**
**NOTE:**

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**If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.**

Select Service $04 with GST (Generic Scan Tool).

**No Tools**

**NOTE:**

**If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.**

Erase DTC in ECM. Refer to HOW TO ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).

- **If the battery is disconnected, the emission-related diagnostic information will be lost within 24 hours.**
- **The following data are cleared when the ECM memory is erased.**
  - Diagnostic trouble codes
  - 1st trip diagnostic trouble codes
  - Freeze frame data
  - System readiness test (SRT) codes
  - Test values

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

## SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Service $01 of ISO 15031-5.

As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating "INCMP", use the information in this Service Manual to set the SRT to "CMPLT".

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate "CMPLT" for each application system. Once set as "CMPLT", the SRT status remains "CMPLT" until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate "INCMP" for these items.

**NOTE:**

The SRT will also indicate "INCMP" if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates "CMPLT" for all test items, the inspector will continue with the emissions test. However, if the SRT indicates "INCMP" for one or more of the SRT items the vehicle is returned to the customer untested.

**NOTE:**

If MIL is ON during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates "CMPLT" for all test items. Therefore, it is important to check SRT ("CMPLT") and DTC (No DTCs) before the inspection.

SRT Item

The table below shows required self-diagnostic items to set the SRT to "CMPLT".

| SRT item | Performance Priority | Required self-diagnostic items to set the SRT to "CMPLT" | Corresponding DTC No. |
|---|---|---|---|
| CATALYST | 2 | Three way catalyst function | P0420 |
| HO2S | 1 | Heated oxygen sensor 1 | P1133 |
| | | Heated oxygen sensor 1 | P1143 |
| | | Heated oxygen sensor 1 | P1144 |
| | | Heated oxygen sensor 2 | P0139 |
| | | Heated oxygen sensor 2 | P1146 |
| | | Heated oxygen sensor 2 | P1147 |
| HO2S HTR | 1 | Heated oxygen sensor 1 heater | P0135 |
| | | Heated oxygen sensor 2 heater | P0141 |

SRT Set Timing

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SRT is set as "CMPLT" after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

| Self-diagnosis result | | Example | | | | |
|---|---|---|---|---|---|---|
| | | Diagnosis | Ignition cycle ← ON → | OFF ← ON → | OFF ← ON → | OFF ← ON → |
| All OK | Case 1 | P0400 | OK (1) | — (1) | OK (2) | — (2) |
| | | P0402 | OK (1) | — (1) | — (1) | OK (2) |
| | | P1402 | OK (1) | OK (2) | — (2) | — (2) |
| | | SRT of EGR | "CMPLT" | "CMPLT" | "CMPLT" | "CMPLT" |
| | Case 2 | P0400 | OK (1) | — (1) | — (1) | — (1) |
| | | P0402 | — (0) | — (0) | OK (1) | — (1) |
| | | P1402 | OK (1) | OK (2) | — (2) | — (2) |
| | | SRT of EGR | "INCMP" | "INCMP" | "CMPLT" | "CMPLT" |
| NG exists | Case 3 | P0400 | OK | OK | — | — |
| | | P0402 | — | — | — | — |
| | | P1402 | NG | — | NG | NG (Consecutive NG) |
| | | (1st trip) DTC | 1st trip DTC | — | 1st trip DTC | DTC (= MIL ON) |
| | | SRT of EGR | "INCMP" | "INCMP" | "INCMP" | "CMPLT" |

OK: Self-diagnosis is carried out and the result is OK.

NG: Self-diagnosis is carried out and the result is NG.

—: Self-diagnosis is not carried out.

When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate "CMPLT". → Case 1 above

When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate "CMPLT" at the time the respective self-diagnoses have at least one OK result. → Case 2 above

If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate "CMPLT". → Case 3 above

The table above shows that the minimum number of cycles for setting SRT as "INCMP" is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate "CMPLT" at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires "CMPLT" of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to "CMPLT" of SRT, the self-diagnosis memory must be erased from ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate "INCMP".

**NOTE:**

SRT can be set as "CMPLT" together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates "CMPLT".

SRT Service Procedure

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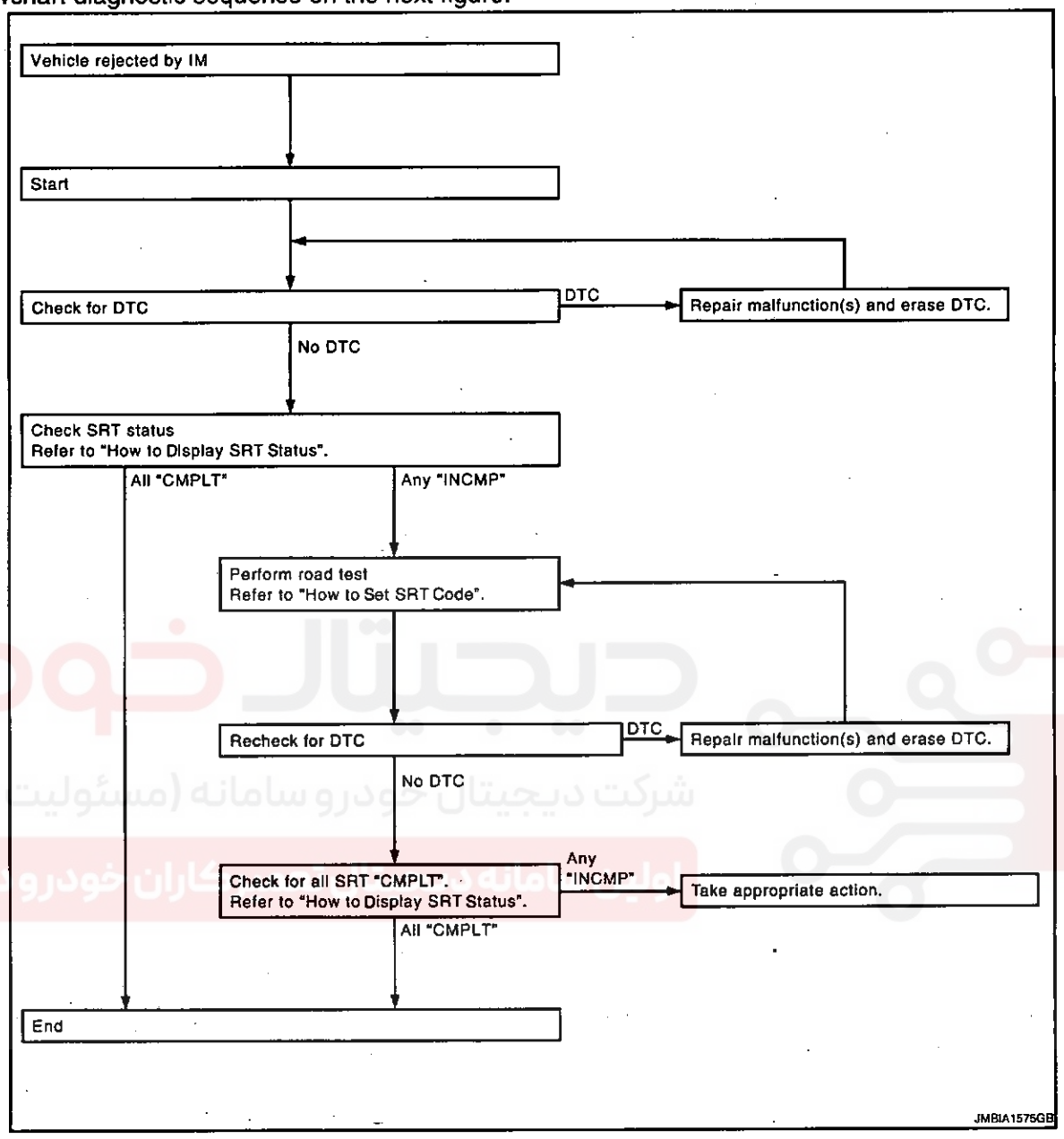
If a vehicle has failed the state emissions inspection due to one or more SRT items indicating "INCMP", review the flowchart diagnostic sequence on the next figure.




How to Display SRT Code

**WITH GST**

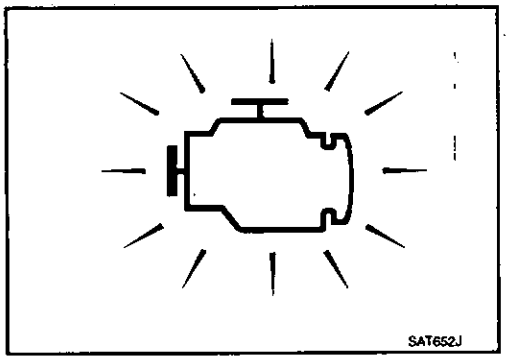
Selecting Service $01 with GST (Generic Scan Tool)

## MALFUNCTION INDICATOR (MIL)

Description

The MIL is located on the instrument panel.

1. The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   If the MIL does not light up, check MIL circuit. Refer to EC-254, "Diagnosis Procedure".
2. When the engine is started, the MIL should go off.
   If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.



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On Board Diagnostic System Function

The on board diagnostic system has the following four functions.

| Diagnostic Test Mode | KEY and ENG. Status | Function | Explanation of Function |
|---|---|---|---|
| Mode I | Ignition switch in ON position  Engine stopped  | BULB CHECK | This function checks the MIL bulb for damage (blown, open circuit, etc.). If the MIL does not come on, check MIL circuit. |
| | Engine running  | MALFUNCTION WARNING | This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MIL in the 1st trip. • Misfire (Possible three way catalyst damage) • One trip detection diagnoses |
| Mode II | Ignition switch in ON position  Engine stopped  | SELF-DIAGNOSTIC RESULTS | This function allows DTCs and 1st trip DTCs to be read. |
| | Engine running  | HEATED OXYGEN SENSOR 1 MONITOR | This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read. |

Diagnostic Test Mode I — Bulb Check

In this mode, the MIL on the instrument panel should stay ON. If it remains OFF, check MIL circuit. Refer to EC-254, "Component Function Check".

Diagnostic Test Mode I — Malfunction Warning

| MIL | Condition |
|---|---|
| ON | When the malfunction is detected. |
| OFF | No malfunction. |

This DTC number is clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

Diagnostic Test Mode II — Self-diagnostic Results

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MIL as shown below. The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are



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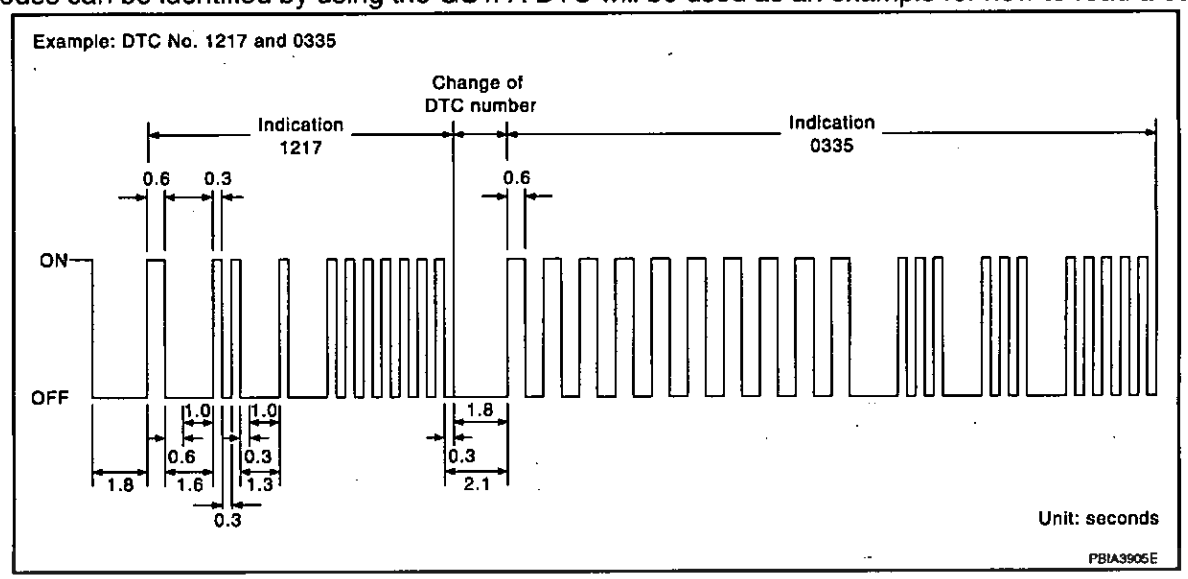
displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the GST. A DTC will be used as an example for how to read a code.




A particular trouble code can be identified by the number of four-digit numeral flashes. The "zero" is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. (See EC-272, "DTC Index".)
The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to "HOW TO ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)".
- If the battery is disconnected, the DTC will be lost from the backup memory within 24 hours.
- Be careful not to erase the stored memory before starting trouble diagnoses.

Diagnostic Test Mode II — Heated Oxygen Sensor 1 Monitor
In this mode, the MIL displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

| MIL | Fuel mixture condition in the exhaust gas | Air fuel ratio feedback control condition |
|---|---|---|
| ON | Lean | Closed loop system |
| OFF | Rich | |
| *Remains ON or OFF | Any condition | Open loop system |

*: Maintains conditions just before switching to open loop.
To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no load conditions. Then make sure that the MIL comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no load.
MIL FLASHING WITHOUT DTC
If the ECM is in Diagnostic Test Mode II, MIL may flash when engine is running. In this case, check ECM diagnostic test mode. How to switch the diagnostic test (function) modes, and details of the above functions are described later. Refer to "How to Switch Diagnostic Test Mode".

How to Switch Diagnostic Test Mode
**NOTE:**
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned OFF.**

HOW TO SET DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)



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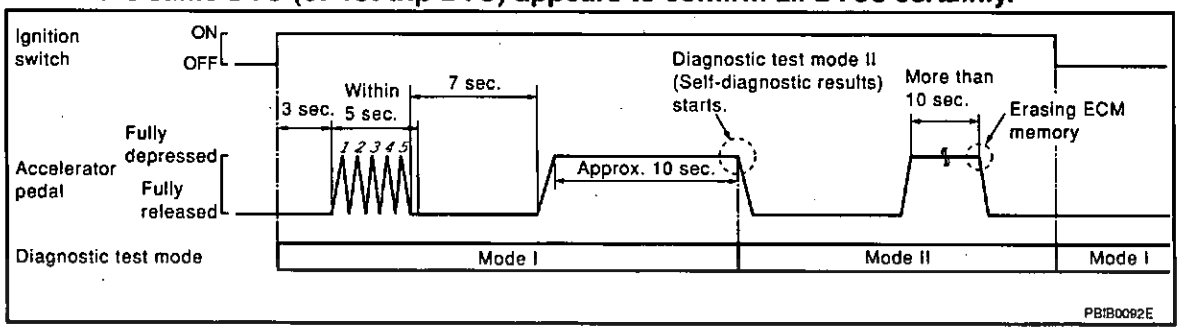
1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MIL starts blinking.
4. Fully release the accelerator pedal.
   ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).
   **NOTE:**
   **Wait until the same DTC (or 1st trip DTC) appears to confirm all DTCs certainly.**




HOW TO SET DIAGNOSTIC TEST MODE II (HEATED OXYGEN SENSOR 1 MONITOR)

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results).
2. Start Engine.
   ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

HOW TO ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results).
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
   The emission-related diagnostic information has been erased from the backup memory in the ECM.
3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

## OBD System Operation Chart

Relationship Between MIL, 1st Trip DTC, DTC and Detectable Items

- When a malfunction is detected for the first time, the 1st trip DTC is stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on.
- The MIL will go off after the vehicle is driven 3 times (pattern B) with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (pattern C) without the same malfunction recurring.
- The 1st trip DTC is not displayed when the self-diagnosis results in OK for the 2nd trip.

Summary Chart

| Items | Fuel Injection System | Misfire | Other |
|---|---|---|---|
| MIL (goes off) | 3 (pattern B) | 3 (pattern B) | 3 (pattern B) |
| DTC, Freeze Frame Data (no display) | 80 (pattern C) | 80 (pattern C) | 40 (pattern A) |
| 1st Trip DTC (clear) | 1 (pattern C), *1 | 1 (pattern C), *1 | 1 (pattern B) |

For details about patterns B and C under "Fuel Injection System" and "Misfire", see "EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM".

For details about patterns A and B under Other, see "EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM".

*1: Clear timing is at the moment OK is detected.

*2: Clear timing is when the same malfunction is detected in the 2nd trip.

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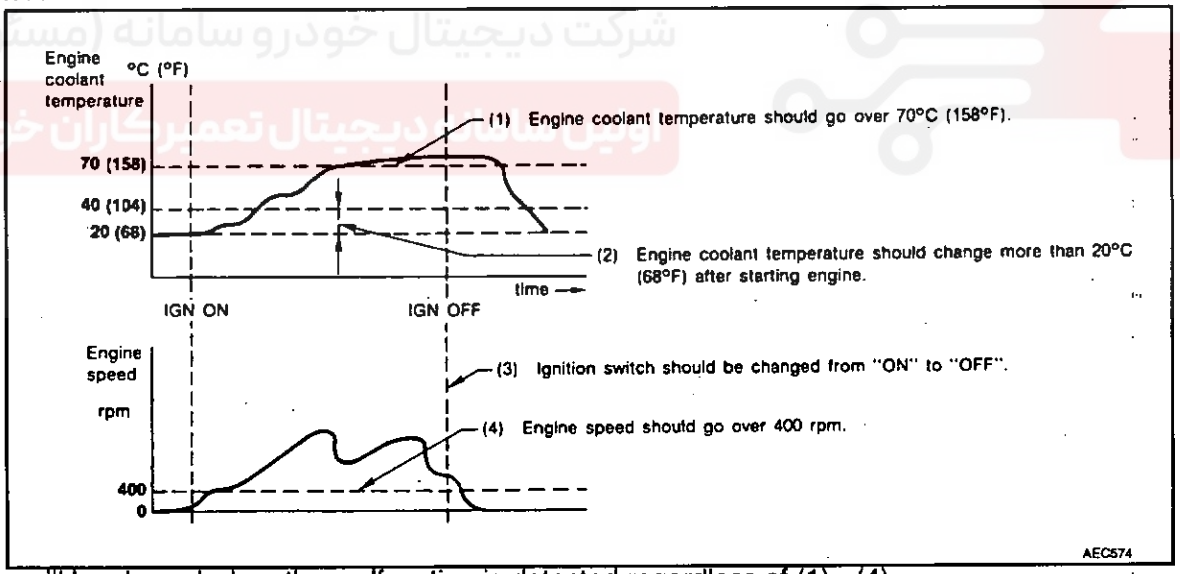
Explanation for Driving Patterns for "Misfire <Exhaust Quality Deterioration>", "Fuel Injection System"
<Driving Pattern B>
Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.
- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MIL will go off when the B counter reaches 3. (*2 in "OBD SYSTEM OPERATION CHART")

<Driving Pattern C>
Driving pattern C means the vehicle operation as follows:
The following conditions should be satisfied at the same time:
Engine speed: (Engine speed in the freeze frame data) ±375 rpm
Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
Engine coolant temperature (T) condition:
- When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F).

Example:
If the stored freeze frame data is as follows:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)
- The C counter will be cleared when the malfunction is detected regardless of vehicle conditions above.
- The C counter will be counted up when vehicle conditions above is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

Explanation for Driving Patterns Except for "Misfire <Exhaust Quality Deterioration>", "Fuel Injection System"
<Driving Pattern A>




- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

<Driving Pattern B>
Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.
- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (*2 in OBD SYSTEM OPERATION CHART).

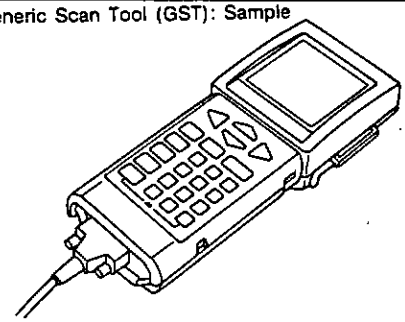
## Diagnosis Tool Function

INFOID:0000000004899627

DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with ISO 15031-5 has several functions explained below.
ISO9141 is used as the protocol.
The name "GST" or "Generic Scan Tool" is used in this service manual.

Generic Scan Tool (GST): Sample



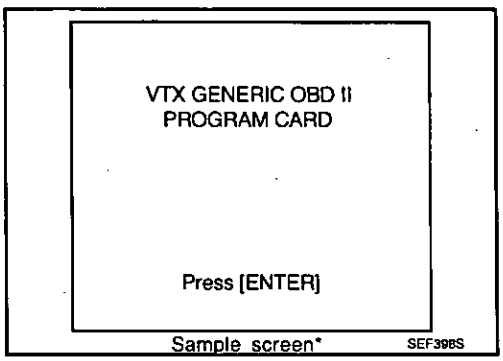
SEF139P

## FUNCTION

| Diagnostic Service | | Function |
|---|---|---|
| Service $01 | READINESS TESTS | This diagnostic service gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information. |
| Service $02 | (FREEZE DATA) | This diagnostic service gains access to emission-related data value which were stored by ECM during the freeze frame. For details, refer to EC-272, "DTC Index". |
| Service $03 | DTCs | This diagnostic service gains access to emission-related power train trouble codes which were stored by ECM. |
| Service $04 | CLEAR DIAG INFO | This diagnostic service can clear all emission-related diagnostic information. This includes:<br>• Clear number of diagnostic trouble codes (Service $01)<br>• Clear diagnostic trouble codes (Service $03)<br>• Clear trouble code for freeze frame data (Service $01)<br>• Clear freeze frame data (Service $02)<br>• Reset status of system monitoring test (Service $01)<br>• Clear on board monitoring test results (Service $06 and $07) |
| Service $06 | (ON BOARD TESTS) | This diagnostic service accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored. |
| Service $07 | (ON BOARD TESTS) | This diagnostic service enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions. |
| Service $08 | — | This diagnostic service is not applicable on this vehicle. |
| Service $09 | (CALIBRATION ID) | This diagnostic service enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs. |

## INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect "GST" to data link connector, which is located under LH dash panel near the hood opener handle.
3. Turn ignition switch ON.
4. Enter the program according to instruction on the screen or in the operation manual.
   (*: Regarding GST screens in this section, sample screens are shown.)




Sample screen* SEF398S

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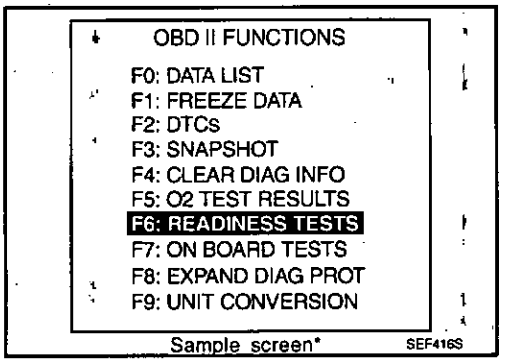
5. Perform each diagnostic mode according to each service procedure.
**For further information, see the GST Operation Manual of the tool maker.**



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# COMPONENT DIAGNOSIS

## POWER SUPPLY AND GROUND CIRCUIT

### Diagnosis Procedure

INFOID:0000000004899831

### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

### 2.CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connectors.
2. Check the continuity between ECM harness connector and ground.

| ECM | | Ground | Continuity |
|---|---|---|---|
| Connector | Terminal | | |
| F7 | 10 | Ground | Existed |
| | 11 | | |
| E16 | 108 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

### 3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

### 4.CHECK ECM POWER SUPPLY CIRCUIT-I

1. Reconnect ECM harness connectors.
2. Turn ignition switch ON.
3. Check the voltage between ECM harness connector terminals.

| ECM | | | Voltage |
|---|---|---|---|
| Connector | + | - | |
| | Terminal | Terminal | |
| E16 | 93 | 108 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

### 5.DETECT MALFUNCTIONING PART

Check the following.
- 10 A fuse (No. 54)
- Harness connectors M77, E105
- Harness for open or short between ECM and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

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## 6. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
   Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| E16 | 105 | 108 | Ignition switch: ON → OFF | After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop approximately 0V. |

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 9.

## 7. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Turn ignition switch ON.
2. Check the voltage between IPDM E/R harness connector and ground.

| IPDM E/R | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E11 | 10 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace IPDM E/R.

## 8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## 9. CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | | Voltage |
|---|---|---|---|---|
| + | | - | | |
| Connector | Terminal | Connector | Terminal | |
| F7 | 32 | E16 | 108 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 10.

## 10. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| ECM | | IPDM E/R | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F7 | 32 | E11 | 15 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?



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YES >> GO TO 12.
NO >> GO TO 11.

## 11. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E6, F123
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 12. CHECK 20A FUSE

1. Remove 20A fuse (No. 52) from IPDM E/R.
2. Check 20A fuse.

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace 20A fuse.

## 13. CHECK ECM POWER SUPPLY CIRCUIT-VI

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| ECM | | IPDM E/R | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E16 | 105 | E11 | 9 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 14.
NO >> Repair open circuit or short to ground or short power in harness or connectors.

## 14. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.



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# U1000, U1001 CAN COMM CIRCUIT

## Description

INFOID:0000000004899832

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

## DTC Logic

INFOID:0000000004899833

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| U1000 | CAN communication line | When ECM is not transmitting or receiving CAN communication signal of OBD (emission-related diagnosis) for 2 seconds or more. | • Harness or connectors (CAN communication line is open or shorted) |
| U1001 | | When ECM is not transmitting or receiving CAN communication signal other than OBD (emission-related diagnosis) for 2 seconds or more. | |

### DTC CONFIRMATION PROCEDURE

#### 1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-87, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899834

Go to LAN-11, "Trouble Diagnosis Procedure".

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# U1010 CONTROL UNIT (CAN)

## Description

INFOID:0000000004899835

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

## DTC Logic

INFOID:0000000004899836

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| U1010 | CAN communication bus | When detecting error during the initial diagnosis of CAN controller of ECM. | • ECM |

### DTC CONFIRMATION PROCEDURE

#### 1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-88, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899837

#### 1.INSPECTION START

1. Erase DTC.
2. Perform DTC CONFIRMATION PROCEDURE.
   See EC-88, "DTC Logic".
3. Check DTC.

Is the DTC U1010 displayed again?

YES >> GO TO 2.
NO >> INSPECTION END

#### 2.REPLACE ECM

1. Replace ECM.
2. Go to EC-13, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

# P0011 IVT CONTROL

## DTC Logic

INFOID:0000000004899838

### DTC DETECTION LOGIC

**NOTE:**
**If DTC P0011 is displayed with DTC P1111, first perform the trouble diagnosis for EC-164, "DTC Logic".**

| DTC No. | Trouble diagnosis name | Detecting condition | Possible cause |
|---|---|---|---|
| P0011 | Intake valve timing control performance | There is a gap between angle of target and phase-control angle degree. | • Crankshaft position sensor (POS)<br>• Camshaft position sensor (PHASE)<br>• Intake valve control solenoid valve<br>• Accumulation of debris to the signal pick-up portion of the camshaft<br>• Timing chain installation<br>• Foreign matter caught in the oil groove for intake valve timing control |

## Diagnosis Procedure

INFOID:0000000004899839

### 1.CHECK OIL PRESSURE WARNING LAMP

1. Start engine.
2. Check oil pressure warning lamp and confirm it is not illuminated.


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Is oil pressure warning lamp illuminated?

YES >> Go to LU-14, "Inspection".
NO >> GO TO 2.

### 2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-90, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace intake valve timing control solenoid valve.

### 3.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-150, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor (POS).

### 4.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-153, "Component Inspection".

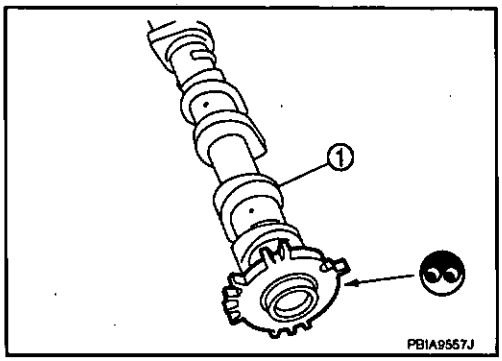
Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace camshaft position sensor (PHASE).

### 5.CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft (1) rear end
- Chipping signal plate of camshaft rear end




Is the inspection result normal?

YES >> GO TO 6.
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.

## 6.CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misaligned.

Are there any service records that may cause timing chain misaligned?

YES >> Check timing chain installation. Refer to EM-165, "Removal and Installation".
NO >> GO TO 7.

## 7.CHECK LUBRICATION CIRCUIT

Refer to EM-179, "Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Clean lubrication line.

## 8.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000004899640

## 1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Check resistance between intake valve timing control solenoid valve terminals as follows.

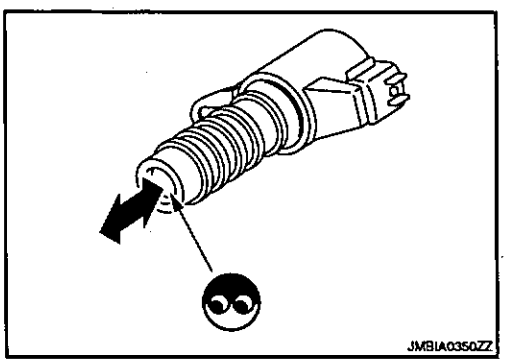
| Terminals | Resistance [at 20°C (68°F)] |
|---|---|
| 1 and 2 | 6.7 - 7.7 Ω |
| 1 or 2 and ground | ∞ Ω (Continuity should not exist) |

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace intake valve timing control solenoid valve.

## 2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.
2. Apply 12V between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.
   **CAUTION:**
   **Do not apply 12V continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.**
   **NOTE:**
   **Always replace O-ring when intake valve timing control solenoid valve is removed.**




Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace intake valve timing control solenoid valve.

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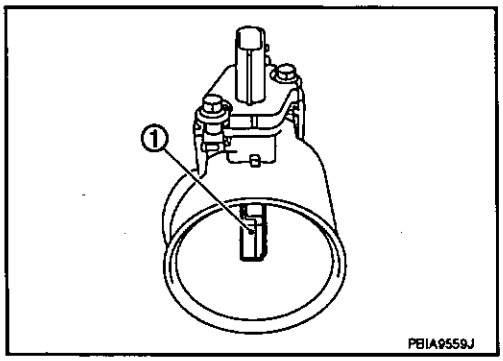
# P0102, P0103 MAF SENSOR

## Description

INFOID:0000000004899841

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.




## DTC Logic

INFOID:0000000004899842

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0102 | Mass air flow sensor circuit low input | An excessively low voltage from the sensor is sent to ECM. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• Intake air leaks<br>• Mass air flow sensor |
| P0103 | Mass air flow sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• Mass air flow sensor |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

Which DTC is detected?

P0102 >> GO TO 2.
P0103 >> GO TO 3.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102

1. Start engine and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-93, "Diagnosis Procedure".
NO >> INSPECTION END

#### 3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-I

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-93, "Diagnosis Procedure".
NO >> GO TO 4.

#### 4.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-II

1. Start engine and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-93, "Diagnosis Procedure".



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NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899843

### 1.INSPECTION START

Confirm the detected DTC.

Which DTC is detected?

P0102 >> GO TO 2.
P0103 >> GO TO 3.

### 2.CHECK INTAKE SYSTEM

Check the following for connection.
- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

Is the inspection result normal?

YES >> GO TO 3.
NO >> Reconnect the parts.

### 3.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace ground connection.

### 4.CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between MAF sensor harness connector and ground.

| MAF sensor | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E18 | 5 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

### 5.CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between MAF sensor harness connector and ECM harness connector.

| MAF sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E18 | 4 | F8 | 52 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

### 6.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between mass air flow sensor and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 7.CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between MAF sensor harness connector and ECM harness connector.

| MAF sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E18 | 3 | F8 | 45 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

## 8.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between mass air flow sensor and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 9.CHECK MASS AIR FLOW SENSOR

Refer to EC-94, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace mass air flow sensor.

## 10.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000004899844

## 1.CHECK MASS AIR FLOW SENSOR-I

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + Terminal | - Terminal | | |
| F8 | 45 (MAF sensor) | 52 | Ignition switch ON (Engine stopped.) | Approx. 0.4V |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.1V |
| | | | Idle to about 4,000 rpm | 0.9 - 1.1V to Approx. 2.4V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH MASS AIR FLOW SENSOR

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through mass air flow sensor. Refer to following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of intake air system parts

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

## 3. CHECK MASS AIR FLOW SENSOR-II

1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Check the voltage between ECM harness connector and ground.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 45 (MAF sensor) | 52 | Ignition switch ON (Engine stopped.) | Approx. 0.4V |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.1V |
| | | | Idle to about 4,000 rpm | 0.9 - 1.1V to Approx. 2.4V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

## 4. CHECK MASS AIR FLOW SENSOR-III

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector and ground.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 45 (MAF sensor) | 52 | Ignition switch ON (Engine stopped.) | Approx. 0.4V |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.1V |
| | | | Idle to about 4,000 rpm | 0.9 - 1.1V to Approx. 2.4V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Clean or replace mass air flow sensor.

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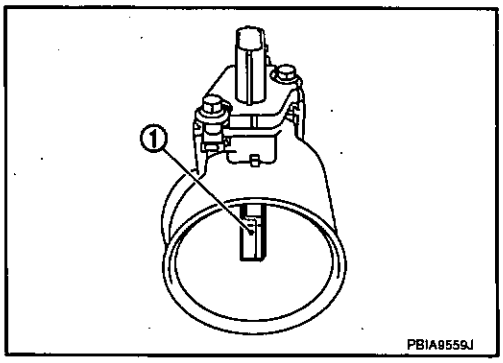
# P0112, P0113 IAT SENSOR

## Description

INFOID:0000000004899845

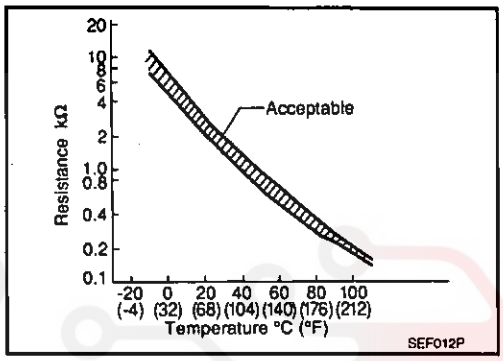
The intake air temperature sensor is built-into mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.




**<Reference data>**

| Intake air temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|---|---|---|
| 25 (77) | 3.3 | 1.800 - 2.200 |
| 80 (176) | 1.2 | 0.283 - 0.359 |

*: These data are reference values and are measured between ECM terminals 46 (Intake air temperature sensor) and 55.




## DTC Logic

INFOID:0000000004899846

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0112 | Intake air temperature sensor circuit low input | An excessively low voltage from the sensor is sent to ECM. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• Intake air temperature sensor |
| P0113 | Intake air temperature sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-97, "Diagnosis Procedure".
NO >> INSPECTION END

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## Diagnosis Procedure

INFOID:0000000004899847

### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

### 2.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between MAF sensor harness connector and ground.

| MAF sensor | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E18 | 2 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

### 3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- Harness for open or short between intake air temperature sensor and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

### 4.CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between MAF sensor harness connector and ECM harness connector.

| MAF sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E18 | 1 | F8 | 55 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

### 5.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- Harness for open or short between intake air temperature sensor and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

### 6.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-98, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace MAF sensor (with intake air temperature sensor).

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## 7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000004899848

## 1.CHECK INTAKE AIR TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as follows.

| Terminals | Condition | | Resistance |
|---|---|---|---|
| 1 and 2 | Temperature °C (°F) | 25 (77) | 1.800 - 2.200 kΩ |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace mass air flow sensor (with intake air temperature sensor).

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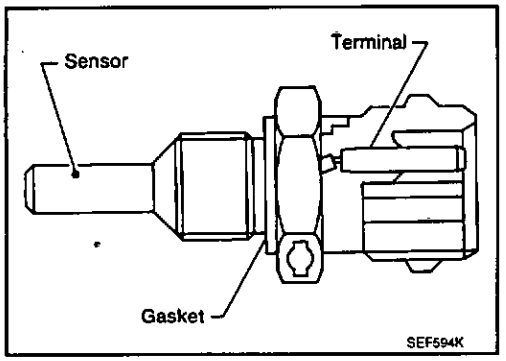
# P0117, P0118 ECT SENSOR

## Description

INFOID:0000000004899849

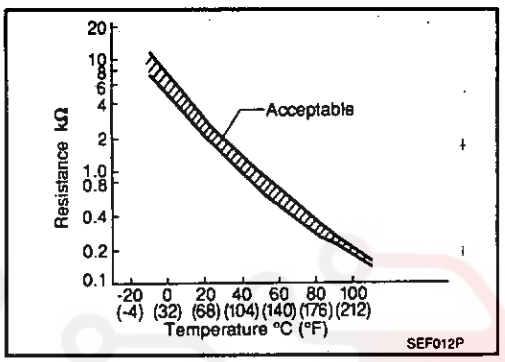
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.




**<Reference data>**

| Engine coolant temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|---|---|---|
| –10 (14) | 4.4 | 7.0 - 11.4 |
| 20 (68) | 3.5 | 2.1 - 2.9 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |

*: These data are reference values and are measured between ECM terminals 38 (Engine coolant temperature sensor) and 44.




## DTC Logic

INFOID:0000000004899850

### DTC DETECTION LOGIC

| DTC No. | Trouble Diagnosis Name | DTC Detecting Condition | Possible Cause |
|---|---|---|---|
| P0117 | Engine coolant temperature sensor circuit low input | An excessively low voltage from the sensor is sent to ECM. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• Engine coolant temperature sensor |
| P0118 | Engine coolant temperature sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-100, "Diagnosis Procedure".
NO >> INSPECTION END

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## Diagnosis Procedure

INFOID:0000000004899851

### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

### 2.CHECK ECT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect engine coolant temperature (ECT) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between ECT sensor harness connector and ground.

| ECT sensor | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F28 | 1 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

### 3.CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECT sensor harness connector and ECM harness connector.

| ECT sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F28 | 2 | F8 | 44 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

### 4.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-100, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace engine coolant temperature sensor.

### 5.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

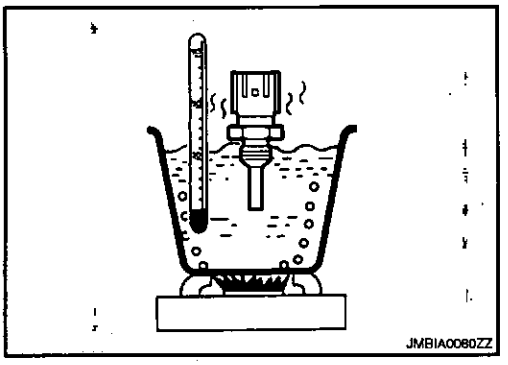
## Component Inspection

INFOID:0000000004899852

### 1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature sensor harness connector.
3. Remove engine coolant temperature sensor.

4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.




| Terminals | Condition | | Resistance |
|---|---|---|---|
| 1 and 2 | Temperature °C (°F) | 20 (68) | 2.1 - 2.9 kΩ |
| | | 50 (122) | 0.68 - 1.00 kΩ |
| | | 90 (194) | 0.236 - 0.260 kΩ |

Is the inspection result normal?

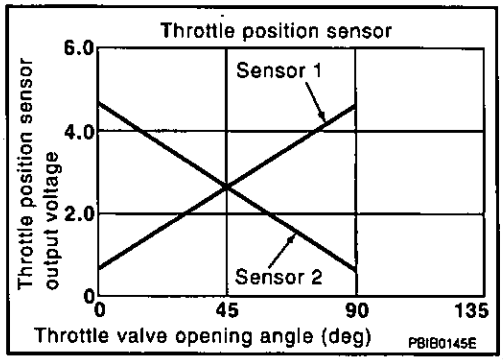
YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor.

# P0122, P0123 TP SENSOR

## Description

INFOID:0000000004899853

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.




## DTC Logic

INFOID:0000000004899854

### DTC DETECTION LOGIC

**NOTE:**
**If DTC P0122 or P0123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-202, "DTC Logic".**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0122 | Throttle position sensor 2 circuit low input | An excessively low voltage from the TP sensor 2 is sent to ECM. | • Harness or connectors (TP sensor 2 circuit is open or shorted.)<br>• Electric throttle control actuator (TP sensor 2) |
| P0123 | Throttle position sensor 2 circuit high input | An excessively high voltage from the TP sensor 2 is sent to ECM. | |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-102, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899855

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

#### 2.CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.

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3. Check the voltage between electric throttle control actuator harness connector and ground.

| Electric throttle control actuator | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F29 | 1 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 3.CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| Electric throttle control actuator | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F29 | 4 | F8 | 36 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| Electric throttle control actuator | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F29 | 3 | F8 | 34 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK THROTTLE POSITION SENSOR

Refer to EC-104, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

## 6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-104, "Special Repair Requirement".

>> INSPECTION END

## 7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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## Component Inspection

INFOID:0000000004899856

### 1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
4. Turn ignition switch ON.
5. Set shift lever to D (CVT) or 1st (M/T) position.
6. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 33 (TP sensor 1 signal) | 36 | Accelerator pedal: Fully released | More than 0.36V |
| | | | Accelerator pedal: Fully depressed | Less than 4.75V |
| | 34 (TP sensor 2 signal) | | Accelerator pedal: Fully released | Less than 4.75V |
| | | | Accelerator pedal: Fully depressed | More than 0.36V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

### 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-104, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

INFOID:0000000004899857

### 1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

### 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END



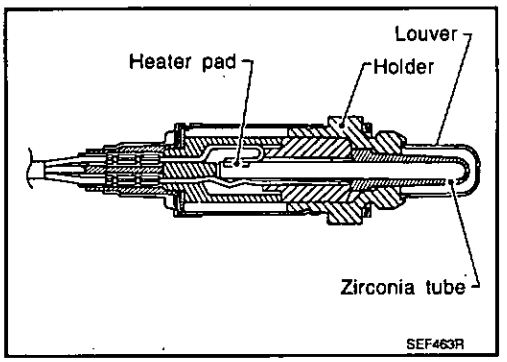
021-62999292

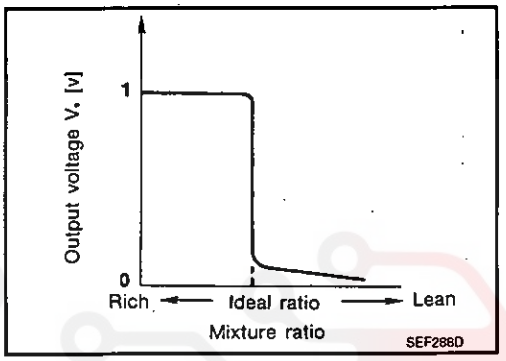
# P0132 HO2S1

## Description

INFOID:0000000004899858

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



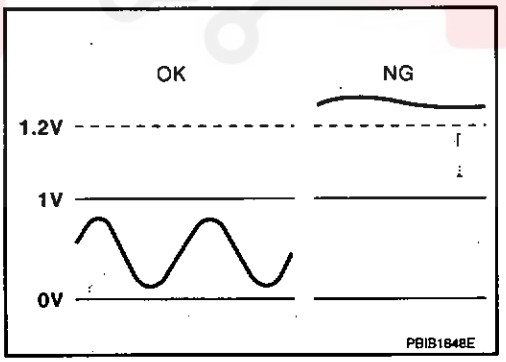




## DTC Logic

INFOID:0000000004899859

### DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 is not inordinately high.




| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible Cause |
|---|---|---|---|
| P0132 | Heated oxygen sensor 1 circuit high voltage | An excessively high voltage from the sensor is sent to ECM. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• Heated oxygen sensor 1 |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

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## 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Check 1st trip DTC.

Is 1st trip DTC is detected?

YES >> Go to EC-106, "Diagnosis Procedure".
NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000004899860

## 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

## 2.RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1. Refer to EM-151, "Removal and Installation".

>> GO TO 3.

## 3.CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between HO2S1 harness connector and ECM harness connector.

| HO2S1 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F30 | 1 | F8 | 56 | existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S1 harness connector and ECM harness connector.

| HO2S1 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F30 | 4 | F8 | 49 | existed |

2. Check harness continuity between HO2S1 harness connector or ECM harness connector and ground.

| HO2S1 | | ECM | | Ground | Continuity |
|---|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | | |
| F30 | 4 | F8 | 49 | Ground | Not existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK HO2S1 CONNECTOR FOR WATER

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Check heated oxygen sensor 1 connector for water.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace harness or connectors.

## 6.CHECK HEATED OXYGEN SENSOR 1

Refer to EC-107, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace heated oxygen sensor 1.

## 7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> **INSPECTION END**

## Component Inspection

INFOID:0000000004899861

## 1.CHECK HEATED OXYGEN SENSOR 1

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + Terminal | - Terminal | | |
| F8 | 49 (HO2S1 signal) | 56 | Engine speed held at 2,000 rpm constant under no load. | • The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.<br>• The maximum voltage is over 0.6V at least 1 time.<br>• The minimum voltage is below 0.3V at least 1 time.<br>• The voltage never exceeds 1.0V.<br>1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V<br>2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

**CAUTION:**

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

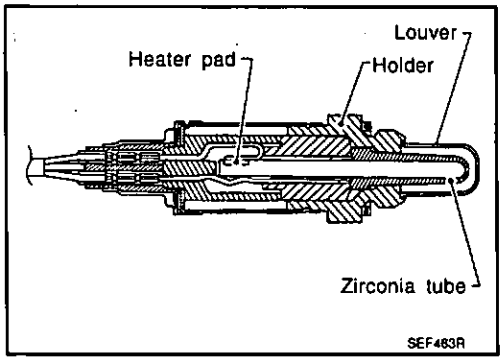
>> INSPECTION END

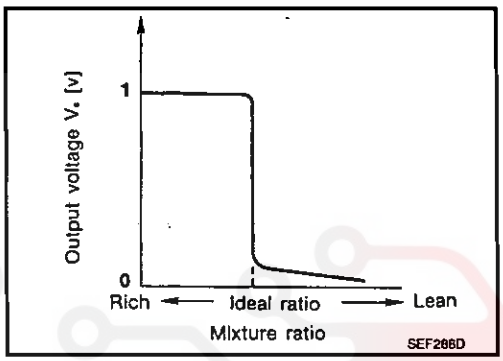
# P0133 HO2S1

## Description

INFOID:0000000004899862

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



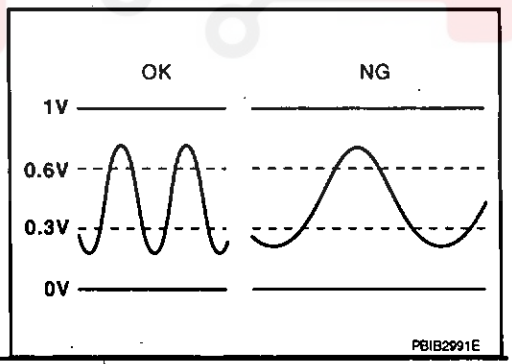




## DTC Logic

INFOID:0000000004899863

### DTC DETECTION LOGIC

To judge the malfunction of heated oxygen sensor 1, this diagnosis measures response time of heated oxygen sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 temperature index. Judgment is based on whether the compensated time (heated oxygen sensor 1 cycling time index) is inordinately long or not.




| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible Cause |
|---|---|---|---|
| P0133 | Heated oxygen sensor 1 circuit slow response | • The response of the voltage signal from the sensor takes more than the specified time. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• Heated oxygen sensor 1<br>• Fuel pressure<br>• Fuel injector<br>• Intake air leaks<br>• Exhaust gas leaks<br>• PCV valve<br>• Mass air flow sensor |

## Component Function Check

INFOID:0000000004899864

### 1.PERFORM COMPONENT FUNCTION CHECK

1. Start engine and warm it up to normal operating temperature.

2. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + Terminal | - Terminal | | |
| F8 | 49 (HO2S1 signal) | 56 | Engine speed held at 2,000 rpm constant under no load. | • The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.<br>1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V<br>2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V |

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to EC-109, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004899865

### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2
NO >> Repair or replace ground connection.

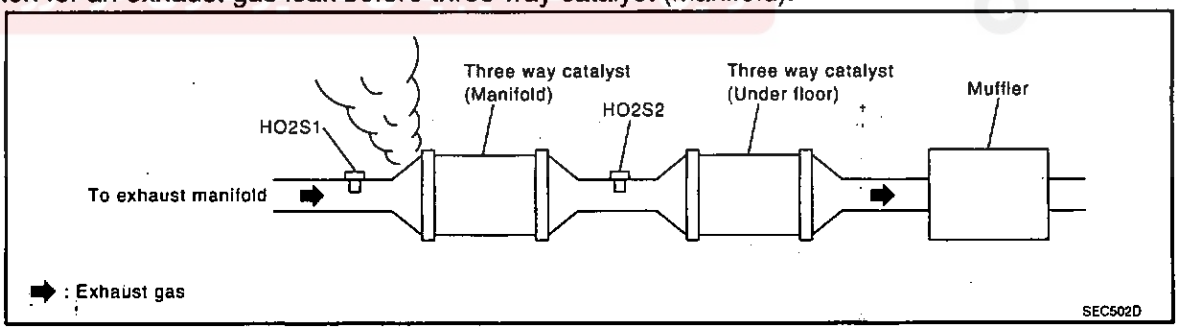
### 2.RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten the heated oxygen sensor 1. Refer to EM-151, "Removal and Installation".

>> GO TO 3.

### 3.CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).




Is exhaust gas leak detected?

YES >> Repair or replace.
NO >> GO TO 4.

### 4.CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.
NO >> GO TO 5.

### 5.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-16, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

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Is the 1st trip DTC P0171 or P172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-129, "DTC Logic" or EC-133, "DTC Logic".

NO >> GO TO 6.

## 6.CHECK HEATED OXYGEN SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S1 harness connector and ECM harness connector.

| HO2S1 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F30 | 1 | F8 | 56 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 7.CHECK HEATED OXYGEN SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S1 harness connector and ECM harness connector.

| HO2S1 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F30 | 4 | F8 | 49 | Existed |

4. Check the continuity between HO2S1 harness connector or ECM harness connector and ground.

| HO2S1 | | ECM | | Ground | Continuity |
|---|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | | |
| F30 | 4 | F8 | 49 | Ground | Not existed |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 8.CHECK MASS AIR FLOW SENSOR

Check mass air flow sensor.

Refer to EC-94, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace mass air flow sensor.

## 9.CHECK PCV VALVE

Refer to EC-255, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace PCV valve.

## 10.CHECK HEATED OXYGEN SENSOR 1

Perform EC-111, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace heated oxygen sensor 1.

## 11.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000004899866

## 1.CHECK HEATED OXYGEN SENSOR 1

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 49 (HO2S1 signal) | 56 | Engine speed held at 2,000 rpm constant under no load. | • The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.<br>• The maximum voltage is over 0.6V at least 1 time.<br>• The minimum voltage is below 0.3V at least 1 time.<br>• The voltage never exceeds 1.0V.<br>1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V<br>2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

**CAUTION:**

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

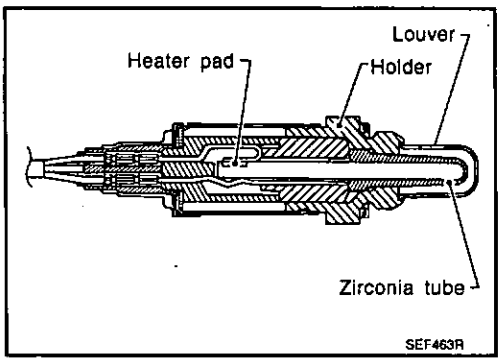
>> INSPECTION END

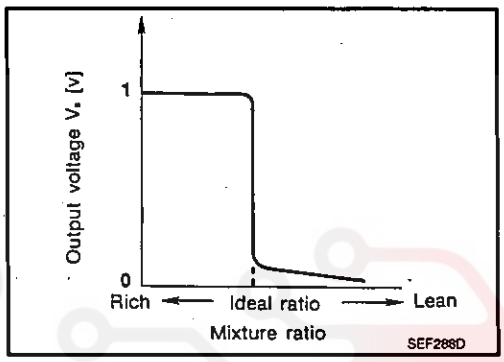
# P0134 HO2S1

## Description

INFOID:0000000004899867

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



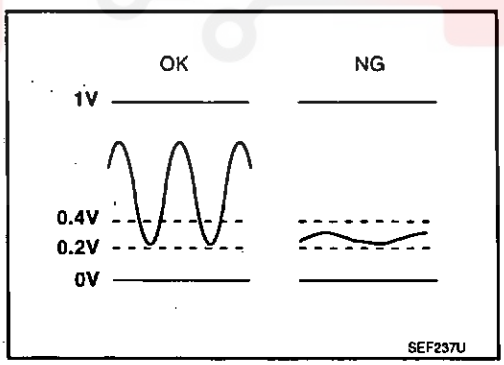




## DTC Logic

INFOID:0000000004899868

### DTC DETECTION LOGIC

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.




| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0134<br>0134 | Heated oxygen sensor 1 circuit no activity detected | The voltage from the sensor is constantly approx. 0.3V. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• Heated oxygen sensor 1 |

## Component Function Check

INFOID:0000000004899869

### 1.PERFORM COMPONENT FUNCTION CHECK

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 49 (HO2S1 signal) | 56 | Engine speed held at 2,000 rpm constant under no load. | • The voltage dose not remain in the range of 0.2 to 0.4. |

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to EC-109, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004899870

### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2
NO >> Repair or replace ground connection.

### 2.CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor (HO2S) 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM harness connector and HO2S1 harness connector.

| HO2S1 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F30 | 1 | F8 | 56 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

### 3.CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S1 harness connector and ECM harness connector.

| HO2S1 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F30 | 4 | F8 | 49 | Existed |

2. Check harness continuity between ECM harness connector or HO2S1 harness connector and ground.

| HO2S1 | | ECM | | Ground | Continuity |
|---|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | | |
| F30 | 4 | F8 | 49 | Ground | Not existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

### 4.CHECK HEATED OXYGEN SENSOR 1

Refer to EC-114, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

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NO >> Replace heated oxygen sensor 1.

## 5.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> **INSPECTION END**

## Component Inspection

INFOID:0000000004899871

## 1.CHECK HEATED OXYGEN SENSOR 1

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 49 (HO2S1 signal) | 56 | Engine speed held at 2,000 rpm constant under no load. | • The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.<br>• The maximum voltage is over 0.6V at least 1 time.<br>• The minimum voltage is below 0.3V at least 1 time.<br>• The voltage never exceeds 1.0V.<br>1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V<br>2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

**CAUTION:**

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END



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# P0135 HO2S1 HEATER

## Description

INFOID:0000000004899872

### SYSTEM DESCRIPTION

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor (PHASE)<br>Crankshaft position sensor (POS) | Engine speed | Heated oxygen sensor 1 heater control | Heated oxygen sensor 1 heater |
| Engine coolant temperature sensor | Engine coolant temperature | | |

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

### OPERATION

| Engine speed | Heated oxygen sensor 1 heater |
|---|---|
| Above 3,400 rpm | OFF |
| Below 3,400 rpm after warming up | ON |

## DTC Logic

INFOID:0000000004899873

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0135 | Heated oxygen sensor 1 heater control circuit low | The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range.<br>(An excessively low voltage signal is sent to ECM through the heated oxygen sensor 1 heater.) | • Harness or connectors<br>(The heated oxygen sensor 1 heater circuit is open or shorted.)<br>• Heated oxygen sensor 1 heater |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

**TESTING CONDITION:**

**Before performing the following procedure, confirm that battery voltage is more than between 11V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Wait at least 5 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-115, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899874

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

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## 2.CHECK HO2S1 HEATER POWER SUPPLY CIRCUIT

1. Disconnect heated oxygen sensor (HO2S) 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between HO2S1 harness connector and ground.

| HO2S1 | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F30 | 2 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

## 3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- 10A fuse (No. 56)
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair or replace harness or connectors.

## 4.CHECK HO2S1 HEATER OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S1 harness connector and ECM harness connector.

| HO2S1 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F30 | 3 | F7 | 3 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-116, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace heated oxygen sensor 1.

## 6.CHECK INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000004899875

## 1.CHECK HEATED OXYGEN SENSOR 1 HEATER

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor (HO2S) 1 harness connector.
3. Check resistance between HO2S1 terminals as follows.

| Terminal | Resistance [at 25°C (77°F)] |
|---|---|
| 2 and 3 | 3.4 - 4.4 Ω |
| 1 and 2, 3, 4 | ∞ Ω (Continuity should not exist) |
| 4 and 1, 2, 3 | |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

**CAUTION:**

- **Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner tool (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

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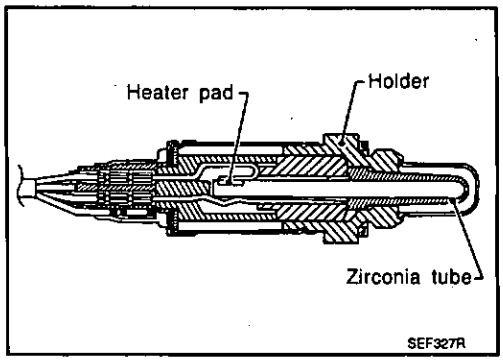
# P0138 HO2S2

## Description

INFOID:0000000004899876

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

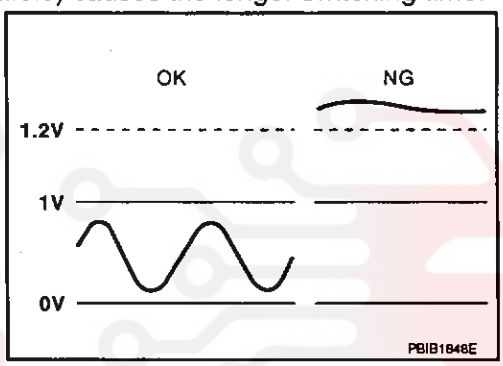



## DTC Logic

INFOID:0000000004899877

### DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time.
To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.




| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0138 | Heated oxygen sensor 2 circuit high voltage | An excessively high voltage from the sensor is sent to ECM. | • Harness or connectors (The sensor circuit is open or shorted)<br>• Heated oxygen sensor 2 |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 2 minutes.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-119, "Diagnosis Procedure".
NO >> INSPECTION END



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## Diagnosis Procedure

INFOID:0000000004899878

### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

### 2.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor (HO2S) 2 harness connector.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S2 harness connector and ECM harness connector.

| HO2S2 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E58 | 1 | F8 | 59 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

### 3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between heated oxygen sensor 2 and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

### 4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| HO2S2 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E58 | 4 | F8 | 50 | Existed |

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

| HO2S2 | | ECM | | Ground | Continuity |
|---|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | | |
| E58 | 4 | F8 | 50 | Ground | Not existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

### 5.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between heated oxygen sensor 2 and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

### 6.CHECK HO2S2 CONNECTOR FOR WATER

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Check connectors for water.

**Water should not exist.**

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace harness or connectors.

## 7.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-120, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace heated oxygen sensor 2.

## 8.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000004899879

## 1.CHECK HEATED OXYGEN SENSOR 2-I

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Keeping engine speed at idle for 10 minutes | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 3.

## 3.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T) | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

## 4. REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

**CAUTION:**

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

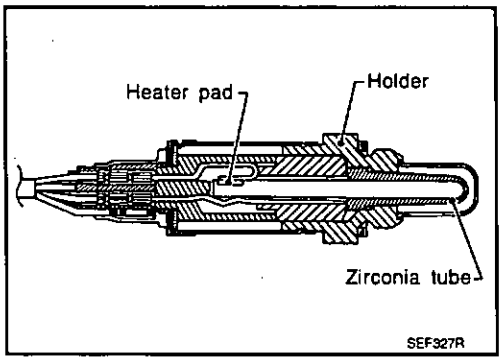
>> INSPECTION END

# P0139 HO2S2

## Description

INFOID:0000000004899880

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

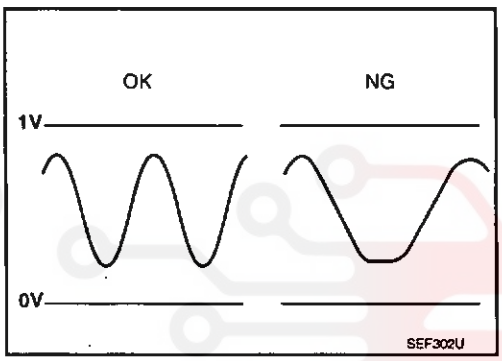



## DTC Logic

INFOID:0000000004899881

### DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.




| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0139 | Heated oxygen sensor 2 circuit slow response | It takes more time for the sensor to respond between rich and lean than the specified time. | • Harness or connectors (The sensor circuit is open or shorted)<br>• Heated oxygen sensor 2<br>• Fuel pressure<br>• Fuel injector<br>• Intake air leaks |

## Component Function Check

INFOID:0000000004899882

### 1. PERFORM COMPONENT FUNCTION CHECK-I

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Revving up to 4,000 rpm under no load at least 10 times | A change of voltage should be more than 0.12 V for 1 second during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

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## 2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Keeping engine speed at idle for 10 minutes | A change of voltage should be more than 0.12 V for 1 second during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 3.

## 3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T) | A change of voltage should be more than 0.12 V for 1 second during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-123, "Diagnosis Procedure".

# Diagnosis Procedure

INFOID:0000000004899883

## 1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

## 2. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-16, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-129, "DTC Logic" or EC-133, "DTC Logic".
NO >> GO TO 3.

## 3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor (HO2S) 2 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

| HO2S2 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E58 | 1 | F8 | 59 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

## 4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between heated oxygen sensor 2 and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| HO2S2 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E58 | 4 | F8 | 50 | Existed |

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

| HO2S2 | | ECM | | Ground | Continuity |
|---|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | | |
| E58 | 4 | F8 | 50 | Ground | Not existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

## 6.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between heated oxygen sensor 2 and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 7.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-124, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace heated oxygen sensor 2.

## 8.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000004899884

## 1.CHECK HEATED OXYGEN SENSOR 2-I

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Keeping engine speed at idle for 10 minutes | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 3.

## 3.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T) | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

## 4.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

**CAUTION:**

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

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# P0141 HO2S2 HEATER

## Description

INFOID:0000000004899885

### SYSTEM DESCRIPTION

| Sensor | Input signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor (PHASE)<br>Crankshaft position sensor (POS) | Engine speed | Heated oxygen sensor 2 heater control | Heated oxygen sensor 2 heater |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Mass air flow sensor | Amount of intake air | | |

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

### OPERATION

| Engine speed rpm | Heated oxygen sensor 2 heater |
|---|---|
| Above 3,600 | OFF |
| Below 3,600 rpm after the following conditions are met.<br>• Engine: After warming up<br>• Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | ON |

## DTC Logic

INFOID:0000000004899886

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0141 | Heated oxygen sensor 2 heater control circuit low | The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | • Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.)<br>• Heated oxygen sensor 2 heater |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

**TESTING CONDITION:**

**Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st tip DTC detected?

YES >> Go to EC-126, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899887

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

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YES >> GO TO 2.
NO >> Repair or replace ground connection.

## 2.CHECK HO2S2 HEATER POWER SUPPLY CIRCUIT

1. Disconnect heated oxygen sensor (HO2S) 2 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between HO2S2 harness connector and ground.

| HO2S2 | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E58 | 2 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

## 3.DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse (No. 56)
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK HO2S2 HEATER OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S2 harness connector and ECM harness connector.

| HO2S2 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E58 | 3 | F7 | 5 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

## 5.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between heated oxygen sensor 2 and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 6.CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-128, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace heated oxygen sensor 2.

## 7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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## Component Inspection

INFOID:0000000004899888

### 1.CHECK HEATED OXYGEN SENSOR 2 HEATER

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Check resistance between heated oxygen sensor 2 terminals as follows.

| Terminals | Resistance [at 25°C (77°F)] |
|---|---|
| 2 and 3 | 3.4 - 4.4 Ω |
| 1 and 2, 3, 4 | ∞ Ω (Continuity should not exist) |
| 4 and 1, 2, 3 | |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

### 2.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

**CAUTION:**

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

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# P0171 FUEL INJECTION SYSTEM FUNCTION

## DTC Logic

INFOID:0000000004899889

### DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and lights up the MIL (2 trip detection logic).

| Sensor | Input signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Heated oxygen sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Fuel injector |

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0171 | Fuel injection system too lean | • Fuel injection system does not operate properly.<br>• The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) | • Intake air leaks<br>• Heated oxygen sensor 1<br>• Fuel injector<br>• Exhaust gas leaks<br>• Incorrect fuel pressure<br>• Lack of fuel<br>• Mass air flow sensor<br>• Incorrect PCV hose connection |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to EC-16, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Start engine.

Is it difficult to start engine?

YES >> GO TO 3.
NO >> GO TO 4.

#### 3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

Does engine start?

YES >> Go to EC-130, "Diagnosis Procedure".
NO >> Check exhaust and intake air leak visually.

#### 4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Start engine and let it idle for at least 10 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-130, "Diagnosis Procedure".
NO >> GO TO 5.

#### 5.PERFORM DTC CONFIRMATION PROCEDURE-III

1. Turn ignition switch OFF and wait at least 10 seconds.



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2. Start engine and drive the vehicle under the similar conditions to Freeze Frame Data for 10 minutes. Refer to the table below.
**Hold the accelerator pedal as steady as possible.**
The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

| | |
|---|---|
| Engine speed | Engine speed in the freeze frame data ± 400 rpm |
| Vehicle speed | Vehicle speed in the freeze frame data ± 10 km/h (6 MPH) |
| Engine coolant temperature (T) condition | When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F). |
| | When the freeze frame data shows higher than or equal to 70 °C (158 °F), T should be higher than or equal to 70 °C (158 °F). |

**CAUTION:**
**Always drive at a safe speed.**

3. Check 1st trip DTC.

Is 1st trip DTC detected?

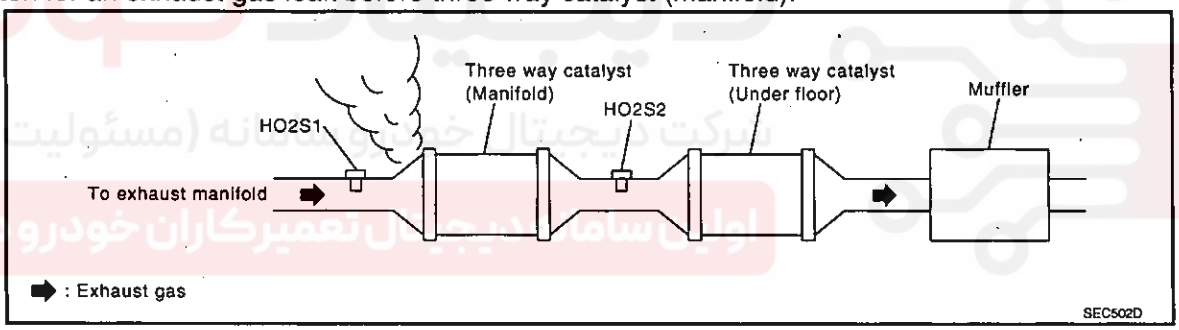
YES >> Go to EC-130, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899890

### 1.CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).




Is exhaust gas leak detected?

YES >> Repair or replace.
NO >> GO TO 2.

### 2.CHECK FOR INTAKE AIR LEAK

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

Intake air leak detected?

YES >> Repair or replace.
NO >> GO TO 3.

### 3.CHECK HEATED OXYGEN SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor (HO2S) 1 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S1 harness connector and ECM harness connector.

| HO2S1 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F30 | 4 | F8 | 49 | Existed |

5. Check the continuity between HO2S1 harness connector or ECM harness connector and ground.

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| HO2S1 | | ECM | | Ground | Continuity |
|---|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | | |
| F30 | 4 | F8 | 49 | Ground | Not existed |

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-287, "Inspection".
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-287, "Inspection".

**At idling: Approximately 350 kPa (3.5 bar, 3.57 kg/cm$^2$, 51 psi)**

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

## 5.CHECK FUEL HOSES AND FUEL TUBES

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly".
NO >> Repair or replace

## 6.CHECK MASS AIR FLOW SENSOR

**With GST**

1. Install all removed parts.
2. Check mass air flow sensor signal in Service $01 with GST.
   For specification, refer to EC-290, "Mass Air Flow Sensor".

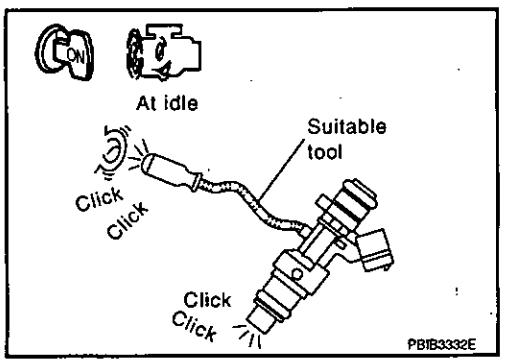
Is the measurement value within the specification?

YES >> GO TO 7.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-92, "DTC Logic".

## 7.CHECK FUNCTION OF FUEL INJECTOR

1. Let engine idle.
2. Listen to each fuel injector operating sound.

**Clicking noise should be heard.**




Is the inspection result normal?

YES >> GO TO 8.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-244, "Component Function Check".

## 8.CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Reconnect all harness connectors disconnected.
4. Remove fuel tube assembly. Refer to EM-157, "Removal and Installation".
   Keep fuel hose and all fuel injectors connected to fuel tube.
   The fuel injector harness connectors should remain connected.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each fuel injector.

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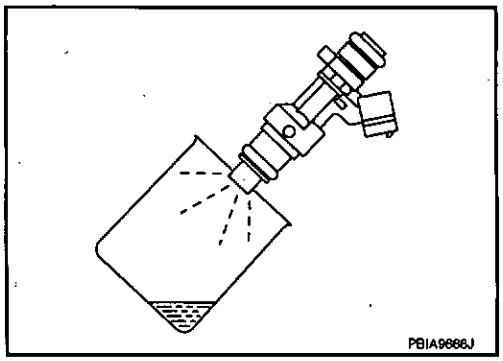
7. Crank engine for about 3 seconds.

**Fuel should be sprayed evenly for each fuel injector.**




Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace fuel injectors from which fuel does not spray out. Always replace O-ring with new ones.

## 9. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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# P0172 FUEL INJECTION SYSTEM FUNCTION

## DTC Logic

INFOID:0000000004899891

### DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and lights up the MIL (2 trip detection logic).

| Sensor | Input signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Heated oxygen sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Fuel injector |

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0172 | Fuel injection system too rich | • Fuel injection system does not operate properly.<br>• The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) | • Heated oxygen sensor 1<br>• Fuel injector<br>• Exhaust gas leaks<br>• Incorrect fuel pressure<br>• Mass air flow sensor |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to EC-16, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Start engine.

Is it difficult to start engine?

YES >> GO TO 3.
NO >> GO TO 4.

#### 3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

Does engine start?

YES >> Go to EC-134, "Diagnosis Procedure".
NO >> Remove spark plugs and check for fouling, etc.

#### 4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Start engine and let it idle for at least 10 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-134, "Diagnosis Procedure".
NO >> GO TO 5.

#### 5.PERFORM DTC CONFIRMATION PROCEDURE-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for 10 minutes. Refer to the table below.
   **Hold the accelerator pedal as steady as possible.**



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The similar conditions to Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

| | |
|---|---|
| Engine speed | Engine speed in the freeze frame data ± 400 rpm |
| Vehicle speed | Vehicle speed in the freeze frame data ± 10 km/h (6 MPH) |
| Engine coolant temperature (T) condition | When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F). |
| | When the freeze frame data shows higher than or equal to 70 °C (158 °F), T should be higher than or equal to 70 °C (158 °F). |

**CAUTION:**
**Always drive at a safe speed.**

3. Check 1st trip DTC.

Is 1st trip DTC detected?

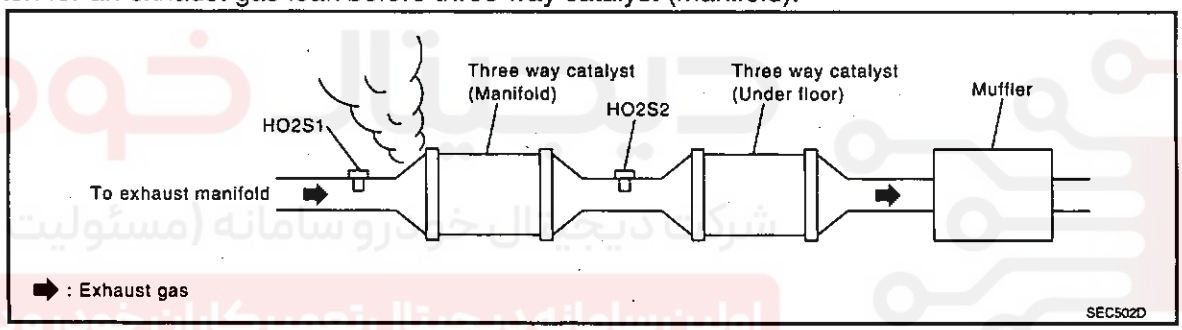
YES >> Go to EC-134, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899892

### 1.CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).




Is exhaust gas leak detected?

YES >> Repair or replace.
NO >> GO TO 2.

### 2.CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.
NO >> GO TO 3.

### 3.CHECK HEATED OXYGEN SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor (HO2S) 1 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S1 harness connector and ECM harness connector.

| HO2S1 sensor 1 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F30 | 4 | F8 | 49 | Existed |

5. Check the continuity between HO2S1 harness connector or ECM harness connector and ground.

| HO2S1 sensor 1 | | ECM | | Ground | Continuity |
|---|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | | |
| F30 | 4 | F8 | 49 | Ground | Not existed |

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-287, "Inspection".
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-287, "Inspection".

**At idling: Approximately 350 kPa (3.5 bar, 3.57 kg/cm$^2$, 51 psi)**

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

## 5.CHECK FUEL HOSES AND FUEL TUBES

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly".
NO >> Repair or replace

## 6.CHECK MASS AIR FLOW SENSOR

**With GST**

1. Install all removed parts.
2. Check mass air flow sensor signal in "Service $01" with GST.
   For specification, refer to EC-290, "Mass Air Flow Sensor".

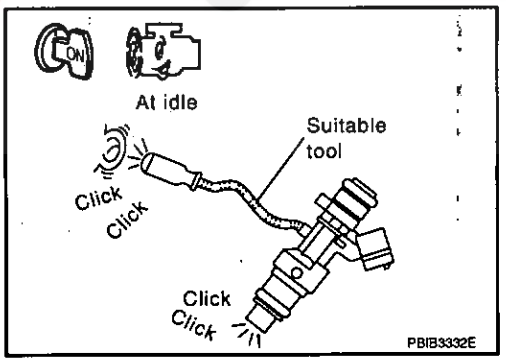
Is the measurement value within the specification?

YES >> GO TO 7.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-92, "DTC Logic".

## 7.CHECK FUNCTION OF FUEL INJECTOR

1. Let engine idle.
2. Listen to each fuel injector operating sound.

**Clicking noise should be heard.**




Is the inspection result normal?

YES >> GO TO 8.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-244, "Component Function Check".

## 8.CHECK FUELINJECTOR

1. Remove fuel injector assembly. Refer to EM-157, "Removal and Installation".
   Keep fuel hose and all fuel injectors connected to fuel tube.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect all fuel injector harness connectors.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each fuel injectors.
6. Crank engine for about 3 seconds.
   Make sure fuel does not drip from fuel injector.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one.

## 9.CHECK INTERMITTENT INCIDENT

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Refer to GI-38, "Intermittent Incident".

>> INSPECTION END





021-62999292

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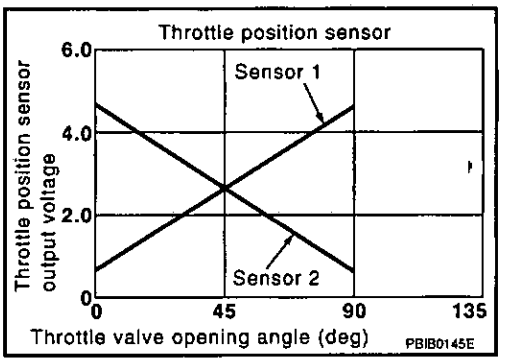
# P0222, P0223 TP SENSOR

## Description

INFOID:0000000004899893

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.




## DTC Logic

INFOID:0000000004899894

### DTC DETECTION LOGIC

**NOTE:**
**If DTC P0222 or P0223 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-202, "DTC Logic".**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0222 | Throttle position sensor 1 circuit low input | An excessively low voltage from the TP sensor 1 is sent to ECM. | • Harness or connectors (TP sensor 1 circuit is open or shorted.)<br>• Electric throttle control actuator (TP sensor 1) |
| P0223 | Throttle position sensor 1 circuit high input | An excessively high voltage from the TP sensor 1 is sent to ECM. | |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-137, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899895

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

#### 2.CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.

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3. Check the voltage between electric throttle control actuator harness connector and ground.

| Electric throttle control actuator | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F29 | 1 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 3.CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| Electric throttle control actuator | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F29 | 4 | F8 | 36 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| Electric throttle control actuator | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F29 | 2 | F8 | 33 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK THROTTLE POSITION SENSOR

Refer to EC-104, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

## 6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-104, "Special Repair Requirement".

>> INSPECTION END

## 7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END



021-62999292

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## Component Inspection

INFOID:0000000004899896

### 1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
4. Turn ignition switch ON.
5. Set shift lever to D (CVT) or 1st (M/T) position.
6. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 33 (TP sensor 1 signal) | 36 | Accelerator pedal: Fully released | More than 0.36V |
| | | | Accelerator pedal: Fully depressed | Less than 4.75V |
| | 34 (TP sensor 2 signal) | | Accelerator pedal: Fully released | Less than 4.75V |
| | | | Accelerator pedal: Fully depressed | More than 0.36V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

### 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-139, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

INFOID:0000000004899897

### 1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

### 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

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# P0300, P0301, P0302, P0303, P0304 MISFIRE

## DTC Logic

INFOID:0000000004899898

### DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

| Sensor | Input signal to ECM | ECM function |
|---|---|---|
| Crankshaft position sensor (POS) | Engine speed | On board diagnosis of misfire |

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the 1st trip, when a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on.
   If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0300 | Multiple cylinder misfire detected | Multiple cylinder misfire. | • Improper spark plug<br>• Insufficient compression<br>• Incorrect fuel pressure<br>• The fuel injector circuit is open or shorted<br>• Fuel injector<br>• Intake air leak<br>• The ignition signal circuit is open or shorted<br>• Lack of fuel<br>• Signal plate<br>• Heated oxygen sensor 1<br>• Incorrect PCV hose connection |
| P0301 | No. 1 cylinder misfire detected | No. 1 cylinder misfires. | |
| P0302 | No. 2 cylinder misfire detected | No. 2 cylinder misfires. | |
| P0303 | No. 3 cylinder misfire detected | No. 3 cylinder misfires. | |
| P0304 | No. 4 cylinder misfire detected | No. 4 cylinder misfires. | |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Restart engine and let it idle for about 15 minutes.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-141, "Diagnosis Procedure".
NO >> GO TO 3.

#### 3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Turn ignition switch OFF and wait at least 10 seconds.

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2. Start engine and drive the vehicle under the similar conditions to Freeze Frame Data for a certain time. Refer to the table below.
**Hold the accelerator pedal as steady as possible.**
The similar conditions to Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.
**CAUTION:**
**Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when driving.**

| | |
|---|---|
| Engine speed | Engine speed in the freeze frame data ± 400 rpm |
| Vehicle speed | Vehicle speed in the freeze frame data ± 10 km/h (6 MPH) |
| Engine coolant temperature (T) condition | When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F). |
| | When the freeze frame data shows higher than or equal to 70 °C (158 °F), T should be higher than or equal to 70 °C (158 °F). |

The time to driving varies according to the engine speed in the freeze frame data.

| Engine speed | Time |
|---|---|
| Around 1,000 rpm | Approximately 10 minutes |
| Around 2,000 rpm | Approximately 5 minutes |
| More than 3,000 rpm | Approximately 3.5 minutes |

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-141, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899899

### 1.CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

Is intake air leak detected?

YES >> Discover air leak location and repair.
NO >> GO TO 2.

### 2.CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

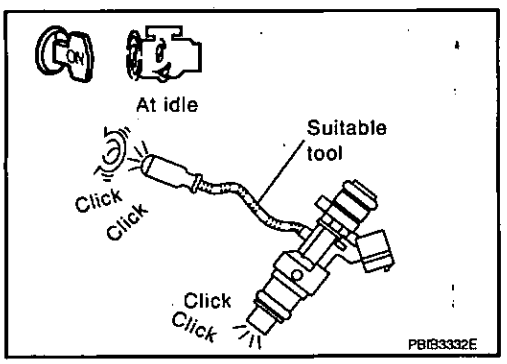
Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace it.

### 3.CHECK FUNCTION OF FUEL INJECTOR

1. Start engine and let engine idle.
2. Listen to each fuel injector operating sound.

**Clicking noise should be heard.**




Is the inspection result normal?

YES >> GO TO 4.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-245, "Component Inspection".

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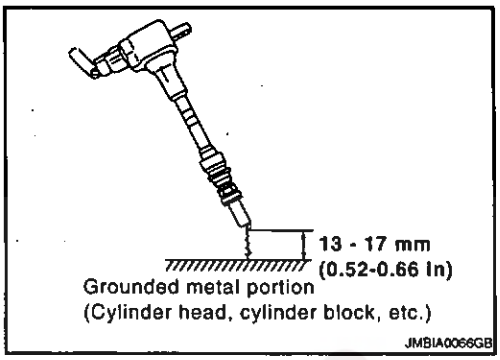
## 4. CHECK FUNCTION OF IGNITION COIL-I

**CAUTION:**
**Do the following procedure in the place where ventilation is good without the combustible.**

1. Turn ignition switch OFF.
2. Remove fuel pump fuse in IPDM E/R to release fuel pressure.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.




**Spark should be generated.**

**CAUTION:**
- **Do not approach to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV or more.**
- **It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken.**

**NOTE:**
**When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.**

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 5.

## 5. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a known-good spark plug.
3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

**Spark should be generated.**

Is the inspection result normal?

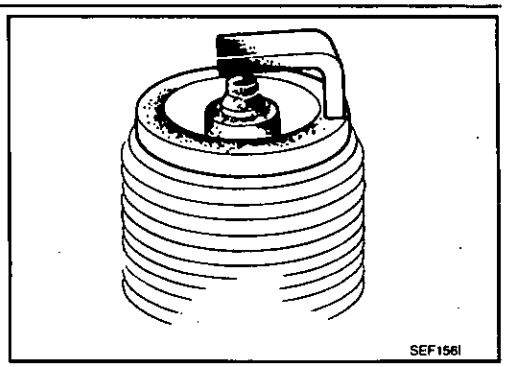
YES >> GO TO 6.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-249, "Component Function Check".

## 6. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-238, "Spark Plug".
NO >> Repair or clean spark plug. Then GO TO 7.



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## 7. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

**Spark should be generated.**

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-238, "Spark Plug".

## 8. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-144, "Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

## 9. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to EC-287, "Inspection".
3. Check fuel pressure. Refer to EC-287, "Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

## 10. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly".
NO >> Repair or replace.

## 11. CHECK IGNITION TIMING

For procedure, refer to EC-10, "BASIC INSPECTION : Special Repair Requirement".
For specification, refer to EC-290, "Idle Speed" and EC-290, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Follow the EC-14, "IGNITION TIMING : Special Repair Requirement".

## 12. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-107, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace heated oxygen sensor 1.

## 13. CHECK MASS AIR FLOW SENSOR

**With GST**
Check mass air flow sensor signal in Service $01 with GST.
For specification, refer to EC-290, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 14.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-92, "DTC Logic".

## 14. CHECK SYMPTOM TABLE

Check items on the rough idle symptom in EC-276, "Symptom Table".

Is the inspection result normal?

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YES >> GO TO 15.
NO >> Repair or replace.

## 15. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-73, "Diagnosis Description".

>> GO TO 16.

## 16. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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# P0327, P0328 KS

## Description

INFOID:0000000004899900

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

## DTC Logic

INFOID:0000000004899901

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detected condition | Possible cause |
|---|---|---|---|
| P0327 | Knock sensor circuit low input | An excessively low voltage from the sensor is sent to ECM. | • Harness or connectors (The sensor circuit is open or shorted.)<br>• Knock sensor |
| P0328 | Knock sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

**TESTING CONDITION:**

**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-145, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899902

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

#### 2.CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect knock sensor harness connector and disconnect ECM harness connector.
2. Check the continuity between knock sensor harness connector and ECM harness connector.

| Knock sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F12 | 2 | F8 | 40 | Existed |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

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## 3. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between knock sensor harness connector and ECM harness connector.

| Knock sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F12 | 1 | F8 | 37 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4. CHECK KNOCK SENSOR

Refer to EC-146, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace knock sensor.

## 5. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000004899903

## 1. CHECK KNOCK SENSOR

1. Turn ignition switch OFF.
2. Disconnect knock sensor harness connector.
3. Check resistance between knock sensor terminals as follows.

**NOTE:**
**It is necessary to use an ohmmeter which can measure more than 10 MΩ.**

| Terminals | Resistance [at 20°C (68°F)] |
|---|---|
| 1 and 2 | Approx. 532 - 588 kΩ |

**CAUTION:**
**Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.**

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace knock sensor.

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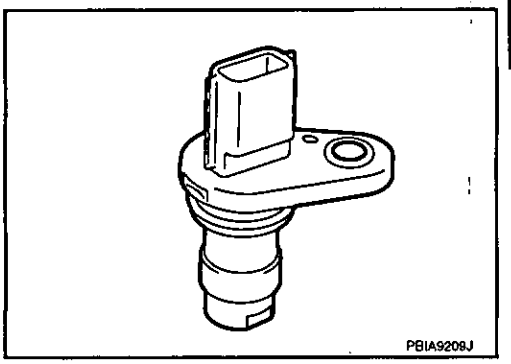
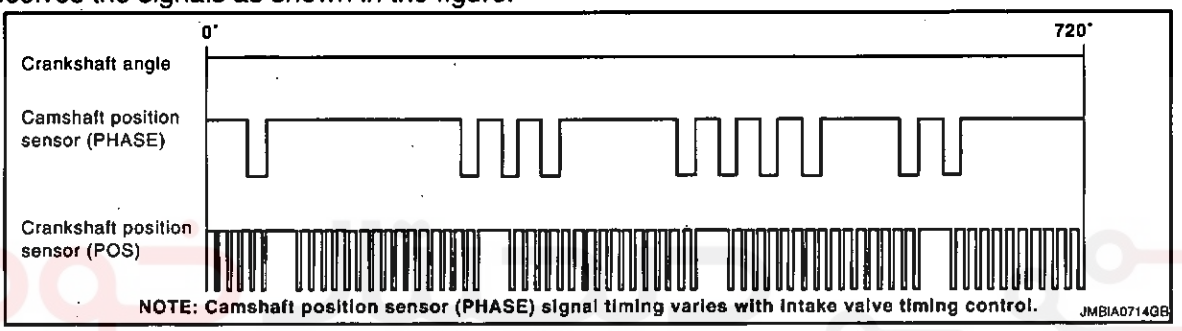
# P0335 CKP SENSOR (POS)

## Description

INFOID:0000000004899904

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.
ECM receives the signals as shown in the figure.




## DTC Logic

INFOID:0000000004899905

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0335 | Crankshaft position sensor (POS) circuit | • The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking.<br>• The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running.<br>• The crankshaft position sensor (POS) signal is not in the normal pattern during engine running. | • Harness or connectors<br>[Crankshaft position sensor (POS) circuit is open or shorted.]<br>(Refrigerant pressure sensor circuit is shorted.)<br>(Accelerator pedal position sensor circuit is shorted.)<br>• Crankshaft position sensor (POS)<br>• Refrigerant pressure sensor<br>• Accelerator pedal position sensor<br>• Signal plate |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
2. Check 1st trip DTC.

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Is 1st trip DTC detected?

YES >> Go to EC-148, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899906

### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

### 2.CHECK CKP SENSOR (POS) POWER SUPPLY CIRCUIT-I

1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between CKP sensor (POS) harness connector and ground.

| CKP sensor (POS) | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F20 | 1 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

### 3.CHECK CKP SENSOR (POS) POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| CKP sensor (POS) | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F20 | 1 | F8 | 75 | Existed |

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit.

### 4.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| ECM | | Sensor | | |
|---|---|---|---|---|
| Connector | Terminal | Name | Connector | Terminal |
| F8 | 74 | Refrigerant pressure sensor | E49 | 3 |
| | 75 | CKP sensor (POS) | F20 | 1 |
| E16 | 102 | APP sensor | E110 | 5 |

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

### 5.CHECK COMPONENTS

Check the following.
- Refrigerant pressure sensor (Refer to EC-256, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning components.

## 6.CHECK APP SENSOR

Refer to EC-223, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 7.

## 7.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-223, "Special Repair Requirement".

>> INSPECTION END

## 8.CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| CKP sensor (POS) | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F20 | 2 | F8 | 62 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 9.CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| CKP sensor (POS) | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F20 | 3 | F8 | 61 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 10.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-150, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace crankshaft position sensor (POS).

## 11.CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace the signal plate.

## 12.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

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>> INSPECTION END

## Component Inspection

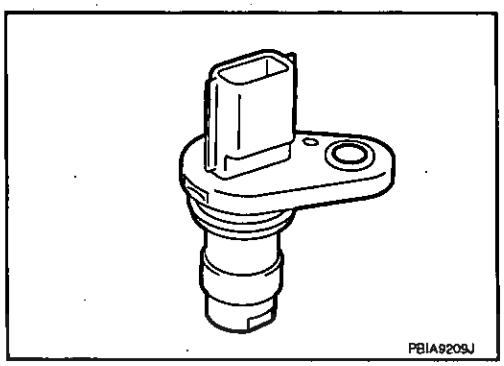
INFOID:0000000004899907

### 1. CHECK CRANKSHAFT POSITION SENSOR (POS)-I

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect crankshaft position sensor (POS) harness connector.
4. Remove the sensor.
5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace crankshaft position sensor (POS).




### 2. CHECK CRANKSHAFT POSITION SENSOR (POS)-II

Check resistance between crankshaft position sensor (POS) terminals as follows.

| Terminals (Polarity) | Resistance [at 25°C (77°F)] |
|---|---|
| 1 (+) - 2 (-) | Except 0 or ∞ Ω |
| 1 (+) - 3 (-) | |
| 2 (+) - 3 (-) | |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace crankshaft position sensor (POS).



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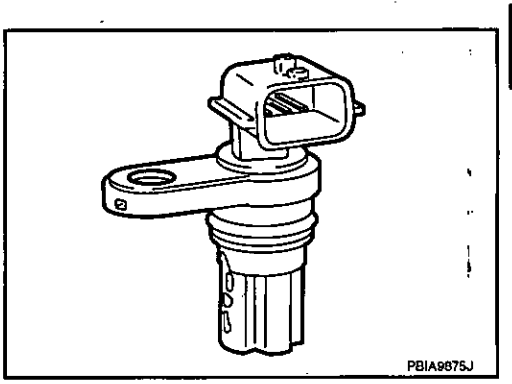
# P0340 CMP SENSOR (PHASE)

## Description

INFOID:0000000004899908

The camshaft position sensor (PHASE) senses the retraction of camshaft (INT) to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
ECM receives the signals as shown in the figure.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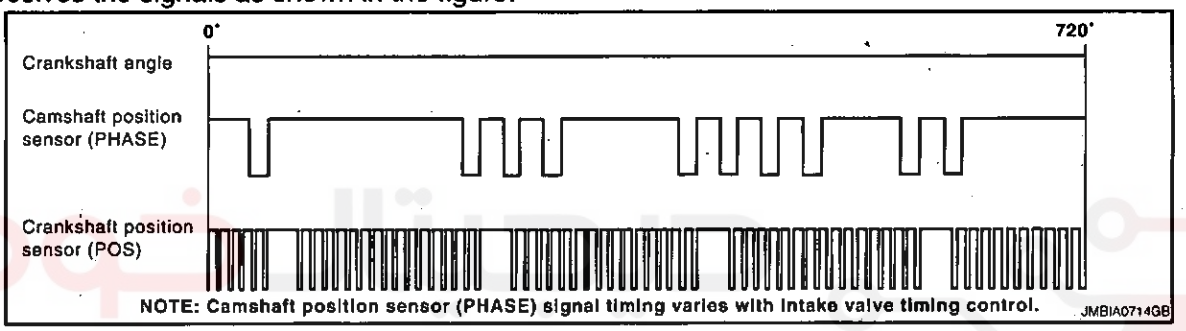


## DTC Logic

INFOID:0000000004899909

### DTC DETECTION LOGIC

**NOTE:**
**If DTC P0340 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-202, "DTC Logic".**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0340 | Camshaft position sensor (PHASE) circuit | • The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking.<br>• The cylinder No. signal is not sent to ECM during engine running.<br>• The cylinder No. signal is not in the normal pattern during engine running. | • Harness or connectors (The sensor circuit is open or shorted)<br>• Camshaft position sensor (PHASE)<br>• Camshaft (INT)<br>• Starter motor<br>• Starting system circuit<br>• Dead (Weak) battery |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
2. Check 1st trip DTC.

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Is 1st trip DTC detected?

YES >> Go to EC-152, "Diagnosis Procedure".
NO >> GO TO 3.

## 3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Maintaining engine speed at more than 800 rpm for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-152, "Diagnosis Procedure".
NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000004899910

## 1.CHECK STARTING SYSTEM

Turn ignition switch to START position.

Does the engine turn over? Does the starter motor operate?

YES >> GO TO 2.
NO >> Check starting system.

## 2.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace ground connection.

## 3.CHECK CMP SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between CMP sensor (PHASE) harness connector and ground.

| CMP sensor (PHASE) | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F26 | 1 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

| CMP sensor (PHASE) | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F26 | 2 | F8 | 63 | Existed |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

| CMP sensor (PHASE) | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F26 | 3 | F8 | 65 | Existed |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 6.CHECK CAMSHAFT POSITION SENSOR (PHASE)

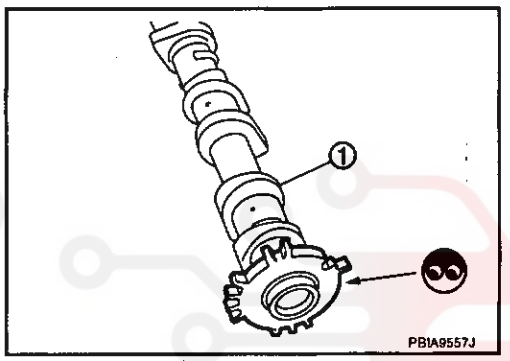
Refer to EC-153, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace camshaft position sensor (PHASE).

## 7.CHECK CAMSHAFT (INT)

Check the following.
- Accumulation of debris to the signal plate of camshaft (1) rear end
- Chipping signal plate of camshaft rear end




Is the inspection result normal?

YES >> GO TO 8.
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.

## 8.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

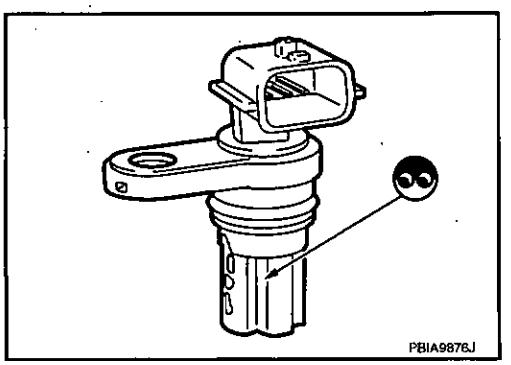
>> INSPECTION END

# Component Inspection

INFOID:0000000004899911

## 1.CHECK CAMSHAFT POSITION SENSOR (PHASE)-I

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect camshaft position sensor (PHASE) harness connector.
4. Remove the sensor.
5. Visually check the sensor for chipping.




Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace camshaft position sensor (PHASE).

## 2.CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

Check resistance camshaft position sensor (PHASE) terminals as follows.

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| Terminals (Polarity) | Resistance [at 25°C (77°F)] |
|---|---|
| 1 (+) - 2 (-) | Except 0 or ∞ Ω |
| 1 (+) - 3 (-) | |
| 2 (+) - 3 (-) | |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace camshaft position sensor (PHASE).

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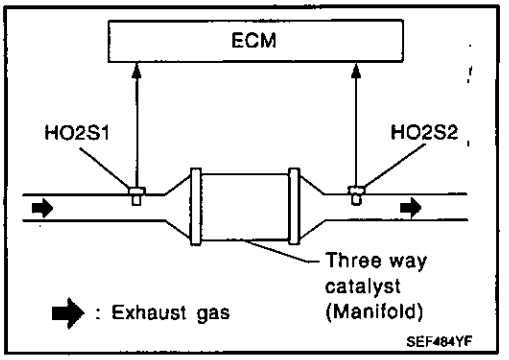
# P0420 THREE WAY CATALYST FUNCTION

## DTC Logic

INFOID:0000000004899912

### DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of heated oxygen sensor 1 and heated oxygen sensor 2.
A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of heated oxygen sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.




| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0420 | Catalyst system efficiency below threshold | • Three way catalyst (manifold) does not operate properly.<br>• Three way catalyst (manifold) does not have enough oxygen storage capacity. | • Three way catalyst (manifold)<br>• Exhaust tube<br>• Intake air leaks<br>• Fuel injector<br>• Fuel injector leaks<br>• Spark plug<br>• Improper ignition timing |

## Component Function Check

INFOID:0000000004899913

### 1.PERFORM COMPONENT FUNCTION CHECK-I

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Specification |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 49 (HO2S1 signal) | 56 | Keeping engine speed at 2,000 rpm constant under no load | The voltage switch periodically more than 5 times within 10 seconds. |

Is the inspection result normal?

YES >> GO TO 2
NO >> Go to EC-108, "DTC Logic".

### 2.PERFORM COMPONENT FUNCTION CHECK-II

1. Set voltmeter probes between ECM harness connector terminals.
2. Make sure that the voltage switching frequency (high&low) HO2S2 voltage is very less than that of HO2S1 voltage under the following condition.

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| ECM | | | Condition | Specification |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 49 (HO2S1 signal) | 56 | Keeping engine speed at 2,000 rpm constant under no load | Switching frequency ratio (A/B): Less than 0.75<br>A: Heated oxygen sensor 2 voltage switching frequency<br>B: Heated oxygen sensor 1 voltage switching frequency |
| | 50 (HO2S2 signal) | 59 | | |

Is the inspection result normal?

YES >> INSPECTION END
NO >> If the ratio is greater than above (0.75), it means three way catalyst does not operate properly. Go to EC-156, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004899914

### 1.CHECK EXHAUST SYSTEM

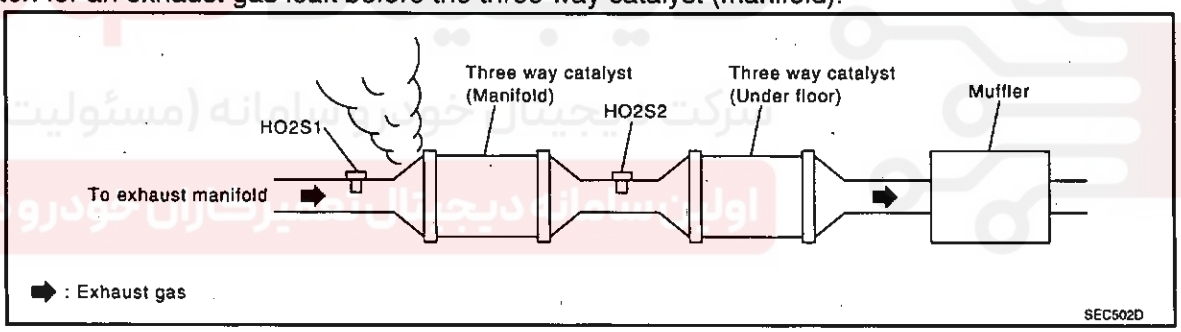
Visually check exhaust tubes and muffler for dent.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace.

### 2.CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before the three way catalyst (manifold).




Is exhaust gas leak detected?

YES >> Repair or replace.
NO >> GO TO 3.

### 3.CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.
NO >> GO TO 4.

### 4.CHECK IGNITION TIMING AND IDLE SPEED

Check the following items. Refer to EC-10, "BASIC INSPECTION : Special Repair Requirement"
For specification, refer to EC-290, "Ignition Timing", EC-290, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Follow the EC-14, "IGNITION TIMING : Special Repair Requirement",EC-14, "IDLE SPEED : Special Repair Requirement".

### 5.CHECK FUEL INJECTOR

1. Stop engine and then turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.



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| ECM | | | | Voltage |
|---|---|---|---|---|
| + | | - | | |
| Connector | Terminal | Connector | Terminal | |
| F7 | 25 | E16 | 108 | Battery voltage |
| | 29 | | | |
| | 30 | | | |
| | 31 | | | |

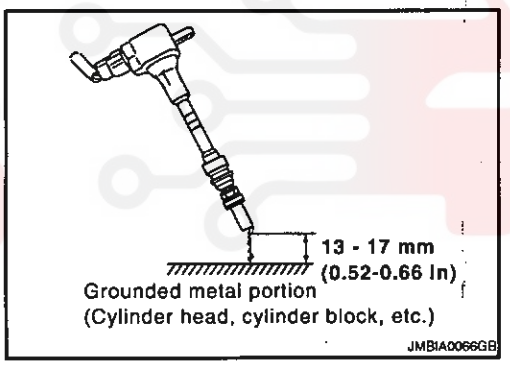
Is the inspection result normal?

YES >> GO TO 6.
NO >> Perform EC-244, "Diagnosis Procedure".

## 6. CHECK FUNCTION OF IGNITION COIL-I

**CAUTION:**
**Do the following procedure in the place where ventilation is good without the combustible.**

1. Turn ignition switch OFF.
2. Remove fuel pump fuse in IPDM E/R to release fuel pressure.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.




**Spark should be generated.**

**CAUTION:**
- **Do not approach to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV or more.**
- **It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken.**

**NOTE:**
**When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.**

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 7.

## 7. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a known-good spark plug.
3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

**Spark should be generated.**

Is the inspection result normal?

YES >> GO TO 8.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-249, "Diagnosis Procedure".



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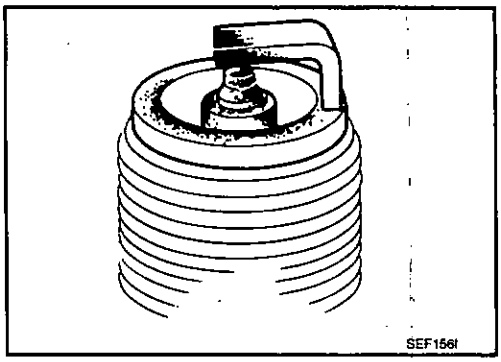
## 8. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-238, "Spark Plug".
NO >> Repair or clean spark plug. Then GO TO 9.




## 9. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for about three seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

**Spark should be generated.**

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-238, "Spark Plug".

## 10. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Remove fuel injector assembly.
   Refer to EM-157, "Removal and Installation".
   Keep fuel hose and all fuel injectors connected to fuel tube.
3. Disconnect all ignition coil harness connectors.
4. Reconnect all fuel injector harness connectors disconnected.
5. Turn ignition switch ON.

Does fuel drip from fuel injector?

YES >> Replace the fuel injector(s) from which fuel is dripping.
NO >> GO TO 11.

## 11. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the trouble fixed?

YES >> INSPECTION END
NO >> Replace three way catalyst (manifold).

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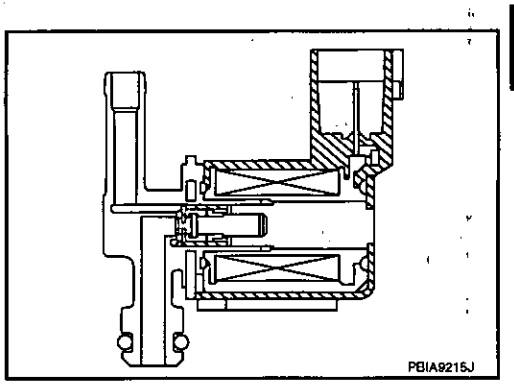
# P0444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

## Description

INFOID:0000000004899915

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.




## DTC Logic

INFOID:0000000004899916

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0444 | EVAP canister purge volume control solenoid valve circuit open | An excessively low voltage signal is sent to ECM through the valve | • Harness or connectors (The solenoid valve circuit is open or shorted.)<br>• EVAP canister purge volume control solenoid valve |

### DTC CONFIRMATION PROCEDURE

#### 1.CONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

**TESTING CONDITION:**

**Before performing the following procedure, confirm battery voltage is more than 11V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 13 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-159, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899917

#### 1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

| EVAP canister purge volume control solenoid valve | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F32 | 1 | Ground | Battery voltage |

Is the inspection result normal?

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YES >> GO TO 3.
NO >> GO TO 2.

## 2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E7, F121
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

| EVAP canister purge volume control solenoid valve | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F32 | 2 | F7 | 9 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-160, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace EVAP canister purge volume control solenoid valve.

## 5.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000004899918

## 1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Remove EVAP canister purge volume control solenoid valve from intake manifold.
4. Disconnect EVAP purge hose connected to EVAP canister purge volume control solenoid valve.
5. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12V direct current supply between terminals 1 and 2 | Existed |
| No supply | Not existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP canister purge volume control solenoid valve



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# P0500 VSS

## Description

INFOID:0000000004899919

The vehicle speed signal is sent to the ECM from the "ABS actuator and electric unit (control unit)" by CAN communication line.

## DTC Logic

INFOID:0000000004899920

### DTC DETECTION LOGIC

**NOTE:**

- **If DTC P0500 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001.Refer to** EC-87, "DTC Logic".
- **If DTC P0500 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to** EC-88, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0500 | Vehicle speed sensor | The almost 0 km/h (0 MPH) signal from vehicle speed signal is sent to ECM even when vehicle is being driven. | • Harness or connectors (The CAN communication line is open or shorted)<br>• Harness or connectors (The vehicle speed signal circuit is open or shorted)<br>• Wheel sensor<br>• ABS actuator and electric unit (control unit) |

## Component Function Check

INFOID:0000000004899921

### 1.PERFORM COMPONENT FUNCTION CHECK

**With GST**

1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed signal in Service $01 with GST.
   The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-161, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004899922

### 1.CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to BRC-49, "Diagnostic Work Sheet".

Is DTC detected?

NO >> INSPECTION END
YES >> Perform trouble shooting relevant to DTC indicated.

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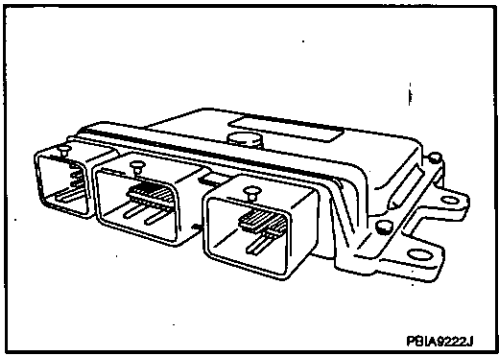
# P0605 ECM

## Description

INFOID:0000000004899923

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.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## DTC Logic

INFOID:0000000004899924

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | | Possible cause |
|---|---|---|---|---|
| P0605 | Engine control module | A) | ECM calculation function is malfunctioning. | • ECM |
| | | B) | ECM EEP-ROM system is malfunctioning. | |
| | | C) | ECM self shut-off function is malfunctioning. | |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Turn ignition switch ON.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-163, "Diagnosis Procedure".
NO >> GO TO 3.

#### 3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-163, "Diagnosis Procedure".
NO >> GO TO 4.

#### 4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
3. Repeat step 2 for 32 times.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-163, "Diagnosis Procedure".
NO >> INSPECTION END

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## Diagnosis Procedure

INFOID:0000000004899925

### 1.INSPECTION START

1. Erase DTC.
2. Perform DTC CONFIRMATION PROCEDURE.
   See EC-162, "DTC Logic".

Is the 1st trip DTC P0605 displayed again?

YES >> GO TO 2.
NO >> INSPECTION END

### 2.REPLACE ECM

1. Replace ECM.
2. Go to EC-13, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

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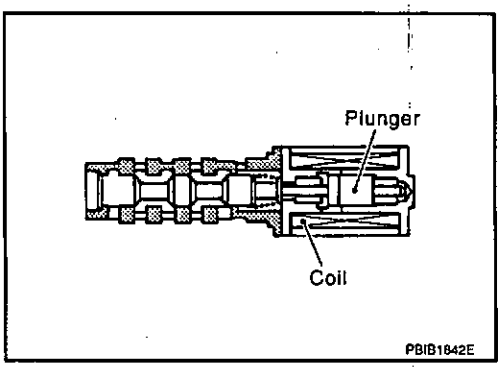
# P1111 IVT CONTROL SOLENOID VALVE

## Description

INFOID:0000000004899926

Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.
The longer pulse width advances valve angle.
The shorter pulse width retards valve angle.
When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.




## DTC Logic

INFOID:0000000004899927

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1111 | Intake valve timing control solenoid valve circuit | An improper voltage is sent to the ECM through intake valve timing control solenoid valve. | • Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.)<br>• Intake valve timing control solenoid valve |

### DTC CONFIRMATION PROCEDURE

**1.** PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO2.

**2.** PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-164, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899928

**1.** CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect intake valve timing (IVT) control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between intake valve timing control solenoid valve harness connector and ground.

| IVT control solenoid valve | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F41 | 2 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

**2.** DETECT MALFUNCTION PART

Check the following.
- Harness connectors E7, F121
- Harness for open or short between intake valve timing control solenoid valve and IPDM E/R

>> Repair or replace harness or connectors.

## 3.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between intake valve timing control solenoid valve harness connector and ECM harness connector.

| IVT control solenoid valve | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F41 | 1 | F8 | 73 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-165, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace intake valve timing control solenoid valve.

## 5.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000004899929

## 1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Check resistance between intake valve timing control solenoid valve terminals as follows.

| Terminals | Resistance [at 20°C (68°F)] |
|---|---|
| 1 and 2 | 6.7 - 7.7 Ω |
| 1 or 2 and ground | ∞ Ω (Continuity should not exist) |

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace intake valve timing control solenoid valve.

## 2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.

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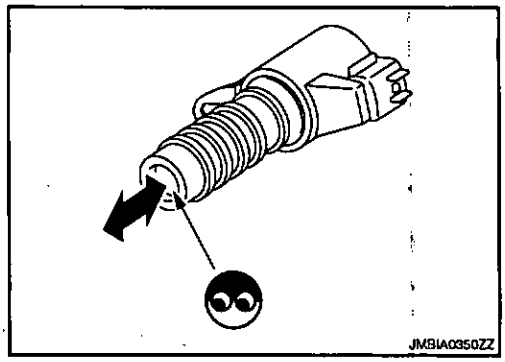
2. Apply 12V between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.
**CAUTION:**
**Do not apply 12V continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.**
**NOTE:**
**Always replace O-ring when intake valve timing control solenoid valve is removed.**




Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace intake valve timing control solenoid valve.

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# P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

## Description

INFOID:0000000004899930

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

## DTC Logic

INFOID:0000000004899931

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | | Possible cause |
|---|---|---|---|---|
| P1121 | Electric throttle control actuator | A) | Electric throttle control actuator does not function properly due to the return spring malfunction. | • Electric throttle control actuator |
| | | B) | Throttle valve opening angle in fail-safe mode is not in specified range. | |
| | | C) | ECM detect the throttle valve is stuck open. | |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.
2. Set shift lever to D (CVT) or 1st (M/T) position and wait at least 3 seconds.
3. Set shift lever to P (CVT) or Neutral (M/T) position.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and wait at least 1 second.
6. Set shift lever to D (CVT) or 1st (M/T) position and wait at least 3 seconds.
7. Set shift lever to P (CVT) or Neutral (M/T) position.
8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
9. Check DTC.

Is DTC detected?

YES >> Go to EC-167, "Diagnosis Procedure".
NO >> GO TO 3.

#### 3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.
2. Set shift lever to D (CVT) or 1st (M/T) position and wait at least 3 seconds.
3. Set shift lever to P (CVT) or Neutral (M/T) position.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.

Is DTC detected?

YES >> Go to EC-167, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899932

#### 1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

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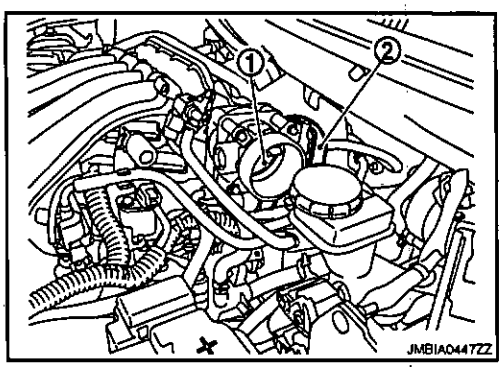
1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve (1) and the housing.




2. Electric throttle control actuator

Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

## 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-199, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

INFOID:0000000004899933

## 1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

## 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

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# P1122 ELECTRIC THROTTLE CONTROL FUNCTION

## Description

INFOID:0000000004899934

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

## DTC Logic

INFOID:0000000004899935

### DTC DETECTION LOGIC

**NOTE:**
**If DTC P1122 is displayed with DTC P1121 or P1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-173, "DTC Logic" or EC-167, "DTC Logic".**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1122 | Electric throttle control performance | Electric throttle control function does not operate properly. | • Harness or connectors (Throttle control motor circuit is open or shorted)<br>• Electric throttle control actuator |

### DTC CONFIRMATION PROCEDURE

**1.** PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 11V when engine is running.**

>> GO TO 2.

**2.** PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-169, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899936

**1.** CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

**2.** CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.

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| ECM | | | | Condition | Voltage |
|---|---|---|---|---|---|
| + | | - | | | |
| Connector | Terminal | Connector | Terminal | | |
| F7 | 2 | E16 | 108 | Ignition switch: OFF | Approx. 0V |
| | | | | Ignition switch: ON | Battery voltage |

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 3.

## 3.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

1. Turn ignition switch OFF.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | | Voltage |
|---|---|---|---|---|
| + | | - | | |
| Connector | Terminal | Connector | Terminal | |
| F7 | 15 | E16 | 108 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

## 4.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| IPDM E/R | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E12 | 25 | F7 | 15 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

## 5.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E6, F123
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness connectors.

## 6.CHECK FUSE

1. Disconnect 15A fuse (No. 51) from IPDM E/R.
2. Check 15A fuse for blown.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace 15A fuse.

## 7.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.



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| IPDM E/R | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E12 | 32 | F7 | 2 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

## 8. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E7, F121
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness connectors.

## 9. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

## 10. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| Electric throttle control actuator | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F29 | 5 | F7 | 1 | Not existed |
| | | | 4 | Existed |
| | 6 | | 1 | Existed |
| | | | 4 | Not existed |

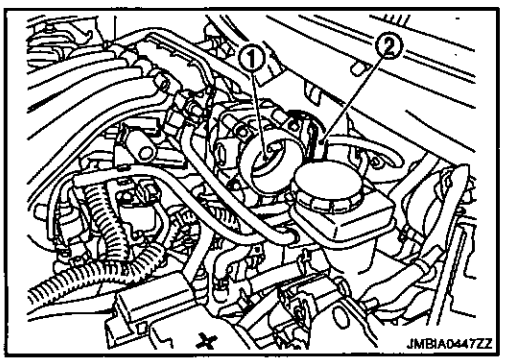
5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair or replace harness or connectors.

## 11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve (1) and the housing.




2. Electric throttle control actuator

Is the inspection result normal?

YES >> GO TO 12.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

## 12. CHECK THROTTLE CONTROL MOTOR

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Refer to EC-172, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 14.

## 13. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Repair or replace harness or connectors.

## 14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunction electric throttle control actuator.
2. Go to EC-172, "Special Repair Requirement".

>> INSPECTION END

# Component Inspection

INFOID:0000000004899937

## 1. CHECK THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between electric throttle control actuator terminals as follows.

| Terminals | Resistance |
|---|---|
| 5 and 6 | Approx. 1 - 15 Ω [at 25 °C (77°F)] |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-172, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

INFOID:0000000004899938

## 1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

## 2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

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# P1124, P1126 THROTTLE CONTROL MOTOR RELAY

## Description

INFOID:0000000004899939

Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

## DTC Logic

INFOID:0000000004899940

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1124 | Throttle control motor relay circuit short | ECM detect the throttle control motor relay is stuck ON. | • Harness or connectors (Throttle control motor relay circuit is shorted)<br>• Throttle control motor relay |
| P1126 | Throttle control motor relay circuit open | ECM detects a voltage of power source for throttle control motor is excessively low. | • Harness or connectors (Throttle control motor relay circuit is open)<br>• Throttle control motor relay |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

**TESTING CONDITION:**

**Before performing the following procedure, confirm that battery voltage is more than 8V.**

Witch DTC is detected?

P1124 >> GO TO 2.
P1126 >> GO TO 3.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1124

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-173, "Diagnosis Procedure".
NO >> INSPECTION END

#### 3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1126

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-173, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899941

#### 1.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch OFF.
2. Check the voltage between ECM harness connector terminals.

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| ECM | | | | Voltage |
|---|---|---|---|---|
| + | | - | | |
| Connector | Terminal | Connector | Terminal | |
| F7 | 15 | E16 | 108 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 2.

## 2.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| IPDM E/R | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E12 | 25 | F7 | 15 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

## 3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E6, F123
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness connectors.

## 4.CHECK FUSE

1. Disconnect 15A fuse (No. 51) from IPDM E/R.
2. Check 15A fuse for blown.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace 15A fuse.

## 5.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Check the voltage between ECM harness connector terminals.

| ECM | | | | Condition | Voltage |
|---|---|---|---|---|---|
| + | | - | | | |
| Connector | Terminal | Connector | Terminal | | |
| F7 | 2 | E16 | 108 | Ignition switch: OFF | Approx. 0V |
| | | | | Ignition switch: ON | Battery voltage |

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 6.

## 6.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

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| IPDM E/R | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E12 | 32 | F7 | 2 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 7.

## 7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E7, F121
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness connectors.

## 8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

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# P1128 THROTTLE CONTROL MOTOR

## Description

INFOID:0000000004899942

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

## DTC Logic

INFOID:0000000004899943

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1128 | Throttle control motor circuit short | ECM detects short in both circuits between ECM and throttle control motor. | • Harness or connectors (Throttle control motor circuit is shorted.)<br>• Electric throttle control actuator (Throttle control motor) |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-176, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899944

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

#### 2.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect electric throttle control actuator harness connector.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| Electric throttle control actuator | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F29 | 5 | F7 | 1 | Not existed |
| | | | 4 | Existed |
| | 6 | | 1 | Existed |
| | | | 4 | Not existed |

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4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace harness or connectors.

## 3.CHECK THROTTLE CONTROL MOTOR

Refer to EC-177, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 5.

## 4.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace harness or connectors.

## 5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-177, "Special Repair Requirement".

>> INSPECTION END

# Component Inspection

INFOID:0000000004899945

## 1.CHECK THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between electric throttle control actuator terminals as follows.

| Terminals | Resistance |
|---|---|
| 5 and 6 | Approx. 1 - 15 Ω [at 25 °C (77°F)] |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-177, "Special Repair Requirement".

>> INSPECTION END

# Special Repair Requirement

INFOID:0000000004899946

## 1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

## 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

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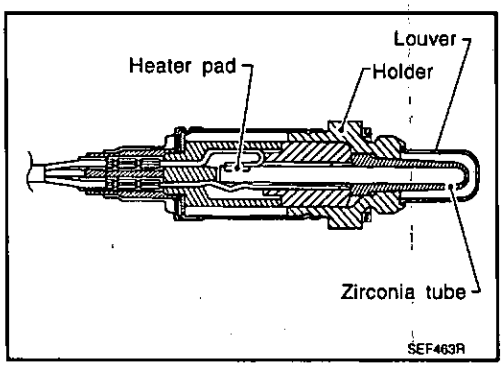
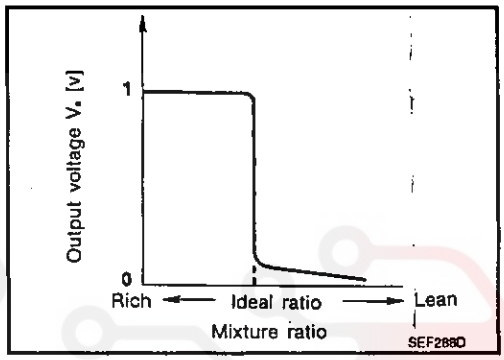
# P1143 HO2S1

## Description

INFOID:0000000004899947

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



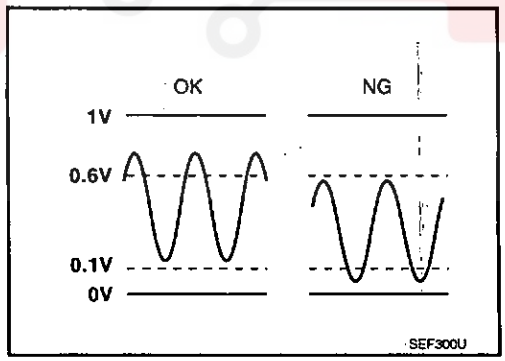




## DTC Logic

INFOID:0000000004899948

### DTC DETECTION LOGIC

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the "rich" output is sufficiently high and whether the "lean" output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.




| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1143 | Heated oxygen sensor 1 lean shift monitoring | The maximum and minimum voltage from the sensor are not reached to the specified voltages. | • Heated oxygen sensor 1<br>• Heated oxygen sensor 1 heater<br>• Fuel pressure<br>• Fuel injector<br>• Intake air leaks |

## Component Function Check

INFOID:0000000004899949

### 1.PERFORM COMPONENT FUNCTION CHECK

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector terminals.



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| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 49 (HO2S1 signal) | 56 | Engine speed held at 2,000 rpm constant under no load. | • The maximum voltage is over 0.6 V at least 1 time.<br>• The minimum voltage is over 0.1 V at least 1 time. |

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to EC-109, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004899950

### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

### 2.RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1. Refer to EM-151, "Removal and Installation".

>> GO TO 3.

### 3.CLEAR THE SELF-LEARNING DATA

1. Clear mixture ratio self-learning value, refer to EC-16, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 detected or difficult to start engine?

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-129, "DTC Logic".
No >> GO TO 4.

### 4.CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-116, "Component Inspection".

Is inspection result normal?

YES >> GO TO 5.
NO >> Replace heated oxygen sensor 1.

### 5.CHECK HEATED OXYGEN SENSOR 1

Refer to EC-179, "Component Inspection".

Is inspection result normal?

YES >> GO TO 6.
NO >> Replace heated oxygen sensor 1.

### 6.CHECK INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000004899951

### 1.CHECK HEATED OXYGEN SENSOR 1

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 49 (HO2S1 signal) | 56 | Engine speed held at 2,000 rpm constant under no load. | • The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.<br>• The maximum voltage is over 0.6V at least 1 time.<br>• The minimum voltage is below 0.3V at least 1 time.<br>• The voltage never exceeds 1.0V.<br>1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V<br>2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

**CAUTION:**

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

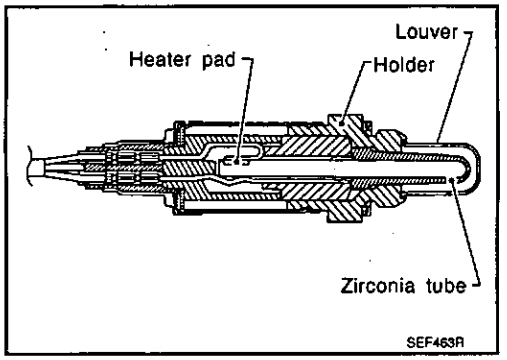
>> INSPECTION END

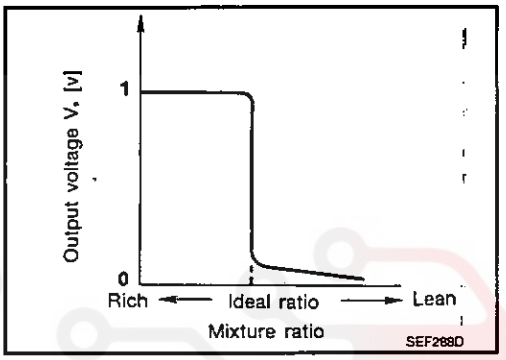
# P1144 HO2S1

## Description

INFOID:0000000004899952

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



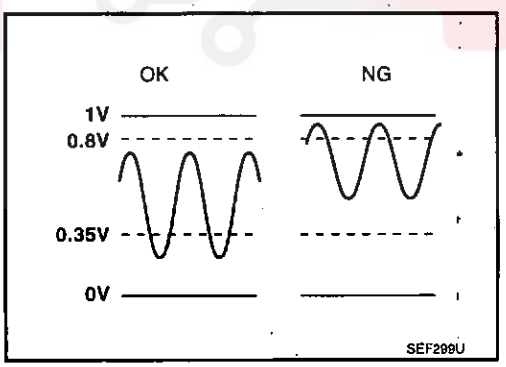




## DTC Logic

INFOID:0000000004899953

### DTC DETECTION LOGIC

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the "rich" output is sufficiently high and "lean" output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.




| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1144 | Heated oxygen sensor 1 rich shift monitoring | The maximum and minimum voltages from the sensor are beyond the specified voltages. | • Heated oxygen sensor 1<br>• Heated oxygen sensor 1 heater<br>• Fuel pressure<br>• Fuel injector |

## Component Function Check

INFOID:0000000004899954

### 1. PERFORM COMPONENT FUNCTION CHECK

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector terminals.

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| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 49 (HO2S1 signal) | 56 | Engine speed held at 2,000 rpm constant under no load. | • The maximum voltage is below 0.8 at least 1 time.<br>• The minimum voltage is below 0.35 at least 1 time. |

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to EC-182, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004899955

### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

### 2.RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1. Refer to EM-151, "Removal and Installation".

>> GO TO 3.

### 3.CLEAR THE SELF-LEARNING DATA

1. Clear the mixture ratio self-learning value, refer to EC-16, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 detected or difficult to start engine?

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-129, "DTC Logic".
No >> GO TO 4

### 4.CHECK HEATED OXYGEN SENSOR 1 CONNECTOR FOR WATER

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check connectors for water.

**Water should not exist.**

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace harness or connectors.

### 5.CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-128, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace heated oxygen sensor 1.

### 6.CHECK HEATED OXYGEN SENSOR 1

Refer to EC-183, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace heated oxygen sensor 1.



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## 7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> **INSPECTION END**

## Component Inspection

INFOID:0000000004899956

## 1. CHECK HEATED OXYGEN SENSOR 1

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 49 (HO2S1 signal) | 56 | Engine speed held at 2,000 rpm constant under no load. | • The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.<br>• The maximum voltage is over 0.6V at least 1 time.<br>• The minimum voltage is below 0.3V at least 1 time.<br>• The voltage never exceeds 1.0V.<br>1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V<br>2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

**CAUTION:**

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

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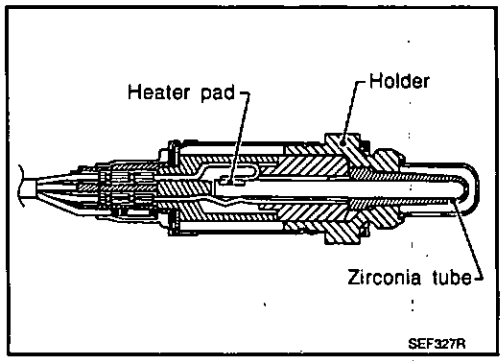
# P1146 HO2S2

## Description

INFOID:0000000004899957

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

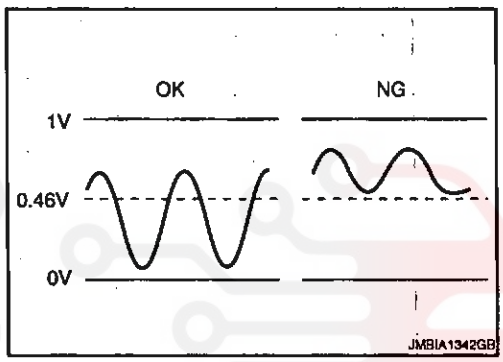



## DTC Logic

INFOID:0000000004899958

### DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently low during the various driving condition such as fuel-cut.




| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1146 | Heated oxygen sensor 2 minimum voltage monitoring | The minimum voltage from the sensor is not reached to the specified voltage. | • Harness or connectors (The sensor circuit is open or shorted)<br>• Heated oxygen sensor 2<br>• Fuel pressure<br>• Fuel injector<br>• Intake air leaks |

## Component Function Check

INFOID:0000000004899959

### 1.PERFORM COMPONENT FUNCTION CHECK-I

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be below 0.46 V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.



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## 2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Keeping engine speed at idle for 10 minutes | The voltage should be below 0.46 V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 3.

## 3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T) | The voltage should be below 0.46 V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-185, "Diagnosis Procedure".

# Diagnosis Procedure

INFOID:0000000004899960

## 1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

## 2. CLEAR THE SELF-LEARNING DATA

1. Clear mixture ratio self-learning value, refer to EC-16, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0172. Refer to EC-133, "DTC Logic".
NO >> GO TO 3.

## 3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor (HO2S) 2 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

| HO2S2 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E58 | 1 | F8 | 59 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

## 4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E7, F121
- Harness for open or short between heated oxygen sensor 2 and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| HO2S2 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E58 | 4 | F8 | 50 | Existed |

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

| HO2S2 | | ECM | | Ground | Continuity |
|---|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | | |
| E58 | 4 | F8 | 50 | Ground | Not existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

## 6.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E7, F121
- Harness for open or short between heated oxygen sensor 2 and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 7.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-186, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace heated oxygen sensor 2.

## 8.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000004899961

## 1.CHECK HEATED OXYGEN SENSOR 2-I

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.

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| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Keeping engine speed at idle for 10 minutes | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 3.

## 3.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T) | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

## 4.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

**CAUTION:**

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END





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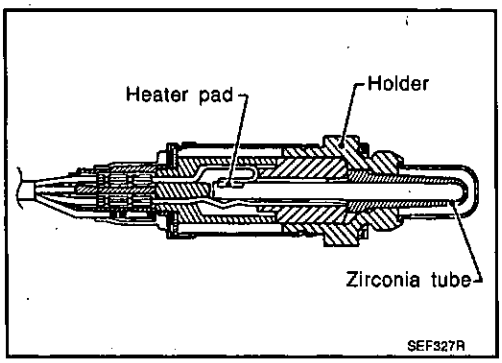
# P1147 HO2S2

## Description

INFOID:0000000004899962

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

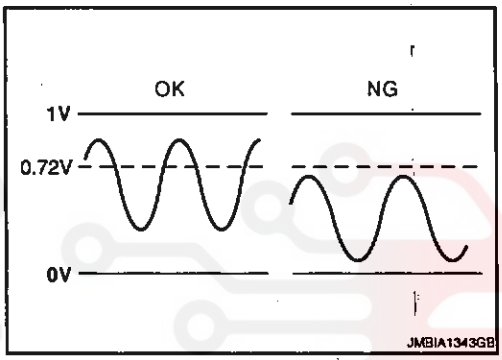



## DTC Logic

INFOID:0000000004899963

### DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.




| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1146 | Heated oxygen sensor 2 maximum voltage monitoring | The maximum voltage from the sensor is not reached to the specified voltage. | • Harness or connectors (The sensor circuit is open or shorted)<br>• Heated oxygen sensor 2<br>• Fuel pressure<br>• Fuel injector<br>• Intake air leaks |

## Component Function Check

INFOID:0000000004899964

### 1.PERFORM COMPONENT FUNCTION CHECK-I

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.72 V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.



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## 2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Keeping engine speed at idle for 10 minutes | The voltage should be above 0.72 V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 3.

## 3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T) | The voltage should be above 0.72 V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-189, "Diagnosis Procedure".

# Diagnosis Procedure

INFOID:0000000004899965

## 1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

## 2. CLEAR THE SELF-LEARNING DATA

1. Clear mixture ratio self-learning value, refer to EC-16, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171. Refer to EC-129, "DTC Logic".
NO >> GO TO 3.

## 3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor (HO2S) 2 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

| HO2S2 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E58 | 1 | F8 | 59 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

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YES >> GO TO 5.
NO >> GO TO 4.

## 4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E7, F121
- Harness for open or short between heated oxygen sensor 2 and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| HO2S2 | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E58 | 4 | F8 | 50 | Existed |

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

| HO2S2 | | ECM | | Ground | Continuity |
|---|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | | |
| E58 | 4 | F8 | 50 | Ground | Not existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

## 6.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E7, F121
- Harness for open or short between heated oxygen sensor 2 and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 7.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-190, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace heated oxygen sensor 2.

## 8.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000004899968

## 1.CHECK HEATED OXYGEN SENSOR 2-I

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.



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| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Keeping engine speed at idle for 10 minutes | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 3.

## 3.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following condition.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 50 (HO2S2 signal) | 59 | Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T) | The voltage should be above 0.72V at least once during this procedure.<br>The voltage should be below 0.46V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

## 4.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

**CAUTION:**

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

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# P1211 TCS CONTROL UNIT

## Description

INFOID:0000000004899967

The malfunction information related to TCS is transferred through the CAN communication line from "ABS actuator and electric unit (control unit)" to ECM.

**Be sure to erase the malfunction information such as DTC not only for "ABS actuator and electric unit (control unit)" but also for ECM after TCS related repair.**

## DTC Logic

INFOID:0000000004899968

### DTC DETECTION LOGIC

**Freeze frame data is not stored in the ECM for this self-diagnosis.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1211 | TCS control unit | ECM receives a malfunction information from "ABS actuator and electric unit (control unit)". | • ABS actuator and electric unit (control unit)<br>• TCS related parts |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

**TESTING CONDITION:**

**Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 60 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-192, "Diagnosis Procedure"
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899969

Go to BRC-49, "Diagnostic Work Sheet".



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# P1212 TCS COMMUNICATION LINE

## Description

INFOID:0000000004899970

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and "ABS actuator and electric unit (control unit)".
**Be sure to erase the malfunction information such as DTC not only for "ABS actuator and electric unit (control unit)" but also for ECM after TCS related repair.**

## DTC Logic

INFOID:0000000004899971

### DTC DETECTION LOGIC

**NOTE:**
- **If DTC P1212 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-87, "DTC Logic".**
- **If DTC P1212 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to EC-88, "DTC Logic".**

**Freeze frame data is not stored in the ECM for this self-diagnosis.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1212 | TCS communication line | ECM can not receive the information from "ABS actuator and electric unit (control unit)" continuously. | • Harness or connectors (The CAN communication line is open or shorted.)<br>• ABS actuator and electric unit (control unit)<br>• Dead (Weak) battery |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-193, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899972

Go to BRC-49, "Diagnostic Work Sheet".

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# P1217 ENGINE OVER TEMPERATURE

## DTC Logic

INFOID:0000000004899973

### DTC DETECTION LOGIC

**NOTE:**

- **If DTC P1217 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-87, "DTC Logic".**
- **If DTC P1217 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to EC-88, "DTC Logic".**

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1217 | Engine over temperature (Overheat) | • Cooling fan does not operate properly (Overheat).<br>• Cooling fan system does not operate properly (Overheat).<br>• Engine coolant was not added to the system using the proper filling method.<br>• Engine coolant is not within the specified range. | • Harness or connectors (The cooling fan circuit is open or shorted.)<br>• IPDM E/R<br>• Cooling fan relay<br>• Cooling fan motor<br>• Radiator hose<br>• Radiator<br>• Reservoir tank cap<br>• Reservoir tank<br>• Water pump<br>• Thermostat<br>• Water control valve |

**CAUTION:**
**When a malfunction is indicated, be sure to replace the coolant. Refer to CO-30, "Draining" and CO-30, "Refilling". Also, replace the engine oil. Refer to LU-15, "Draining" and LU-16, "Refilling".**

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-13, "SAE Viscosity Number".**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

### DTC CONFIRMATION PROCEDURE

#### 1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-194, "Component Function Check".
**NOTE:**
Use component function check to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-195, "Diagnosis Procedure".

## Component Function Check

INFOID:0000000004899974

#### 1.PERFORM COMPONENT FUNCTION CHECK-I

**WARNING:**
**Never remove the reservoir tank cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.**
**Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.**

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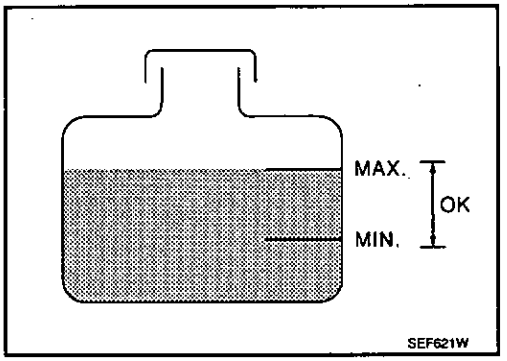
Check the coolant level in the reservoir tank and radiator.
**Allow engine to cool before checking coolant level.**

Is the coolant level in the reservoir tank and/or radiator below the proper range?

YES >> Go to EC-195, "Diagnosis Procedure".
NO >> GO TO 2.




## 2. PERFORM COMPONENT FUNCTION CHECK-II

Confirm whether customer filled the coolant or not.

Did customer fill the coolant?

YES >> Go to EC-195, "Diagnosis Procedure".
NO >> GO TO 3.

## 3. PERFORM COMPONENT FUNCTION CHECK-III

1. Start engine and let it idle.
2. Turn air conditioner switch and blower fan switch ON.
3. Make sure that cooling fan operates at low speed.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to EC-195, "Diagnosis Procedure".

## 4. PERFORM COMPONENT FUNCTION CHECK-IV

1. Turn ignition switch OFF.
2. Turn air conditioner switch and blower fan switch OFF.
3. Disconnect engine coolant temperature sensor harness connector.
4. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
5. Restart engine and make sure that cooling fan operates at higher speed than low speed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-195, "Diagnosis Procedure".

# Diagnosis Procedure

INFOID:0000000004899975

## 1. CHECK COOLING FAN LOW SPEED OPERATION

1. Start engine and let it idle.
2. Turn air conditioner switch ON.
3. Turn blower fan switch ON.
4. Make sure that cooling fan operates at low speed.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Check cooling fan control circuit. Refer to EC-240, "Diagnosis Procedure".

## 2. CHECK COOLING FAN HIGH SPEED OPERATION

1. Turn ignition switch OFF.
2. Turn air conditioner switch and blower fan switch OFF.
3. Disconnect engine coolant temperature sensor harness connector.
4. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
5. Restart engine and make sure that cooling fan operates at higher speed than low speed.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Check cooling fan control circuit. Refer to EC-240, "Diagnosis Procedure".

## 3. CHECK COOLING SYSTEM FOR LEAK



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Check cooling system for leak. Refer to CO-30, "Inspection".

Is leakage detected?

YES >> GO TO 5.
NO >> GO TO 4.

## 4. DETECT MALFUNCTIONING PART

Check the following for leak. Refer to CO-30, "Inspection".

- Hose
- Radiator
- Water pump
- Reservoir tank

>> Repair or replace.

## 5. CHECK RESERVOIR TANK CAP

Check reservoir tank cap. Refer to CO-33, "RESERVOIR TANK CAP : Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace reservoir tank cap.

## 6. CHECK THERMOSTAT

Check thermostat. Refer to CO-42, "Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace thermostat.

## 7. CHECK WATER CONTROL VALVE

Check water control valve. Refer to CO-45, "Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace water control valve.

## 8. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Check engine coolant temperature sensor. Refer to EC-100, "Component Inspection".

Is the inspection result normal?

OK >> GO TO 9.
NG >> Replace engine coolant temperature sensor.

## 9. CHECK MAIN 13 CAUSES

If the cause cannot be isolated, check the following.

| Engine | Step | Inspection item | Equipment | Standard | Reference page |
|---|---|---|---|---|---|
| OFF | 1 | • Blocked radiator<br>• Blocked condenser<br>• Blocked radiator grille<br>• Blocked bumper | • Visual | No blocking | — |
| | 2 | • Coolant mixture | • Coolant tester | MA-13, "SAE Viscosity Number" | |
| | 3 | • Coolant level | • Visual | Coolant up to MAX level in reservoir tank and radiator filler neck | CO-30, "Inspection" |
| | 4 | • Reservoir tank cap | • Pressure tester | CO-33, "RESERVOIR TANK CAP : Inspection" | |
| ON*2 | 5 | • Coolant leaks | • Visual | No leaks | CO-30, "Inspection" |
| ON*2 | 6 | • Thermostat | • Touch the upper and lower radiator hoses | Both hoses should be hot | CO-42, "Inspection" |

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# P1217 ENGINE OVER TEMPERATURE



| Engine | Step | Inspection item | Equipment | Standard | Reference page |
|---|---|---|---|---|---|
| ON*1 | 7 | • Cooling fan motor | • Auto active test | Operating | EC-242, "Component Inspection (Cooling Fan Motor)" |
| OFF | 8 | • Combustion gas leak | • Color checker chemical tester 4 Gas analyzer | Negative | — |
| ON*3 | 9 | • Coolant temperature gauge | • Visual | Gauge less than 3/4 when driving | — |
| | | • Coolant overflow to reservoir tank | • Visual | No overflow during driving and idling | CO-30, "Inspection" |
| OFF*4 | 10 | • Coolant return from reservoir tank to radiator | • Visual | Should be initial level in reservoir tank | CO-30, "Inspection" |
| OFF | 11 | • Water control valve | • Remove and inspect the valve | Within the specified value | CO-45, "Inspection" |
| OFF | 12 | • Cylinder head | • Straight gauge feeler gauge | 0.1 mm (0.004 in) Maximum distortion (warping) | EM-193, "Inspection" |
| | 13 | • Cylinder block and pistons | • Visual | No scuffing on cylinder walls or piston | EM-221, "Inspection" |

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

For more information, refer to CO-26, "Troubleshooting Chart".

>> INSPECTION END







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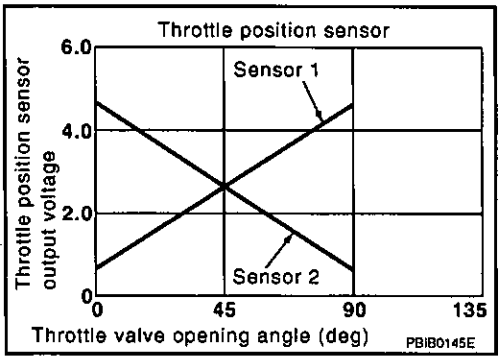
# P1225 TP SENSOR

## Description

INFOID:0000000004899976

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.




## DTC Logic

INFOID:0000000004899977

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1225 | Closed throttle position learning performance | Closed throttle position learning value is excessively low. | • Electric throttle control actuator (TP sensor 1 and 2) |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

**TESTING CONDITION:**

**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-198, "Diagnosis Procedure".
NO >> INSPECTION END

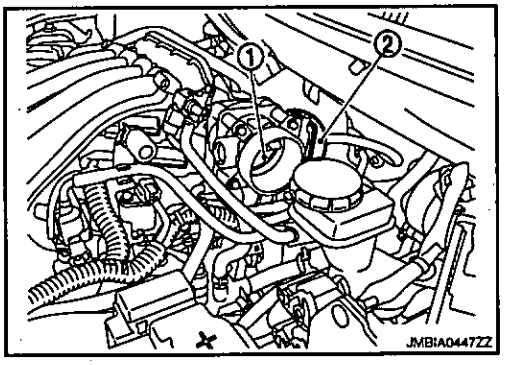
## Diagnosis Procedure

INFOID:0000000004899978

#### 1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.

3. Check if foreign matter is caught between the throttle valve (1) and the housing.




2. Electric throttle control actuator

Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

## 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-199, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

INFOID:0000000004899979

## 1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

## 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

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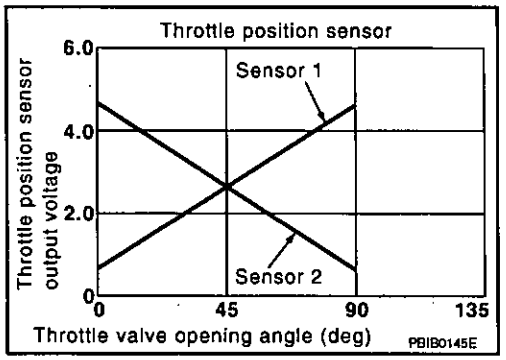
# P1226 TP SENSOR

## Description

INFOID:0000000004899980

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.




## DTC Logic

INFOID:0000000004899981

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1226 | Closed throttle position learning performance | Closed throttle position learning is not performed successfully, repeatedly. | • Electric throttle control actuator (TP sensor 1 and 2) |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Repeat steps 2 and 3 for 32 times.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-200, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899982

#### 1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.



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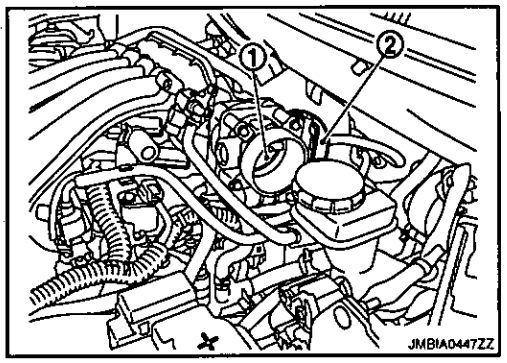
3. Check if foreign matter is caught between the throttle valve (1) and the housing.




2. Electric throttle control actuator

Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

## 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-199, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

INFOID:0000000004899983

### 1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

### 2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

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# P1229 SENSOR POWER SUPPLY

## DTC Logic

INFOID:0000000004899984

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1229 | Sensor power supply circuit short | ECM detects a voltage of power source for sensor is excessively low or high. | • Harness or connectors<br>(APP sensor 1 circuit is shorted.)<br>(TP sensor circuit is shorted.)<br>[Camshaft position sensor (PHASE) circuit is shorted.]<br>• Accelerator pedal position sensor<br>• Throttle position sensor<br>• Camshaft position sensor (PHASE) |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

**TESTING CONDITION:**

**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-202, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899985

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

#### 2.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

| APP sensor | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E110 | 4 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 3.

#### 3.CHECK SENSOR POWER SUPPLY CIRCUITS

Check harness for short to power and short to ground, between the following terminals.

| ECM | | Sensor | | |
|---|---|---|---|---|
| Connector | Terminal | Item | Connector | Terminal |
| F8 | 72 | Electric throttle control actuator | F29 | 1 |
| | 78 | CMP sensor (PHASE) | F26 | 1 |
| E16 | 106 | APP sensor | E110 | 4 |

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair short to ground or short to power in harness or connectors.

## 4.CHECK CAMSHAFT POSITION SENSOR

Refer to EC-153, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace camshaft position sensor (PHASE).

## 5.CHECK TP SENSOR

Refer to EC-104, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 6.

## 6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-104, "Special Repair Requirement".

>> INSPECTION END

## 7.CHECK APP SENSOR

Refer to EC-223, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

## 8.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-14, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> INSPECTION END

## 9.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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# P1564 ASCD STEERING SWITCH

## Description

INFOID:0000000004899986

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
Refer to EC-44, "System Description" for the ASCD function.

## DTC Logic

INFOID:0000000004899987

### DTC DETECTION LOGIC

**NOTE:**
**If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-162, "DTC Logic".**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1564 | ASCD steering switch | • An excessively high voltage signal from the ASCD steering switch is sent to ECM.<br>• ECM detects that input signal from the ASCD steering switch is out of the specified range.<br>• ECM detects that the ASCD steering switch is stuck ON. | • Harness or connectors (The switch circuit is open or shorted.)<br>• ASCD steering switch<br>• ECM |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Wait at least 10 seconds.
3. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Check DTC.

Is DTC detected?

YES >> Go to EC-204, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899988

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YS >> GO TO 2.
NO >> Repair or replace ground connection.

#### 2.CHECK ASCD STEERING SWITCH CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.

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| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| E16 | 94 (ASCD steering switch signal) | 95 | MAIN switch: Pressed | Approx. 0V |
| | | | CANSEL switch: Pressed | Approx. 1V |
| | | | SET/COAST switch: Pressed | Approx. 2V |
| | | | RESUME/ACCELERATE switch: Pressed | Approx. 3V |
| | | | All ASCD steering switches: Released | Approx. 4V |

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

## 3. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect combination switch harness connector M352.
4. Check the continuity between combination switch and ECM harness connector.

| Combination switch | ECM | | Continuity |
|---|---|---|---|
| Terminal | Connector | Terminal | |
| 15 | E16 | 95 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

## 4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M77, E105
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 5. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between ECM harness connector and combination switch.

| combination switch | ECM | | Continuity |
|---|---|---|---|
| Terminal | Connector | Terminal | |
| 14 | E16 | 94 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

## 6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M77, E105
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

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## 7.CHECK ASCD STEERING SWITCH

Refer to EC-206, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace ASCD steering switch.

## 8.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000004899989

## 1.CHECK ASCD STEERING SWITCH

1. Disconnect combination switch (spiral cable) harness connector.
2. Check the continuity between combination switch harness connector terminals under following conditions.

| Combination switch | | Condition | Resistance |
|---|---|---|---|
| Connector | Terminals | | |
| M352 | 14 and 15 | MAIN switch: Pressed | Approx. 0 Ω |
| | | CANCEL switch: Pressed | Approx. 250 Ω |
| | | SET/COAST switch: Pressed | Approx. 660 Ω |
| | | RESUME/ACCELERATE switch: Pressed | Approx. 1,480 Ω |
| | | All ASCD steering switches: Released | Approx. 4,000 Ω |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD steering switch

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# P1572 ASCD BRAKE SWITCH

## Description

INFOID:0000000004899990

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal).
Refer to EC-44, "System Description" for the ASCD function.

## DTC Logic

INFOID:0000000004899991

### DTC DETECTION LOGIC

**NOTE:**

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-162, "DTC Logic".**
- **This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC is displayed. 1st trip DTC is erased when ignition switch OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | | Possible cause |
|---|---|---|---|---|
| P1572 | ASCD brake switch | A) | When the vehicle speed is above 30 km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to the ECM at the same time. | • Harness or connectors (The stop lamp switch circuit is shorted.)<br>• Harness or connectors (The ASCD brake switch circuit is shorted.)<br>• Harness or connectors (The ASCD clutch switch circuit is shorted.)<br>• Stop lamp switch<br>• ASCD brake switch<br>• ASCD clutch switch<br>• Incorrect stop lamp switch installation<br>• Incorrect ASCD brake switch installation<br>• Incorrect ASCD clutch switch installation<br>• ECM |
| | | B) | ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is driving. | |

### DTC CONFIRMATION PROCEDURE

#### 1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

**NOTE:**

Procedure for malfunction B is not described here. It takes extremely long time to complete procedure for malfunction B. By performing procedure for malfunction A, the incident that causes malfunction B can be detected.

>> GO TO 2.

#### 2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine.
2. Press MAIN switch and make sure that CRUISE indicator is displayed in combination meter.
3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

   **CAUTION:**

   **Always drive vehicle at a safe speed.**

   **NOTE:**

   **This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.**

| | |
|---|---|
| Vehicle speed | More than 30 km/h (19 mph) |
| Selector lever | Suitable position |

4. Check DTC.

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Is DTC detected?

YES >> Go to EC-208, "Diagnosis Procedure".
NO >> GO TO 3.

## 3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.
**CAUTION:**
**Always drive vehicle at a safe speed.**
**NOTE:**
**This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.**

| | |
|---|---|
| Vehicle speed | More than 30 km/h (19 mph) |
| Selector lever | Suitable position |
| Driving location | Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned vehicle speed. |

2. Check DTC.

Is DTC detected?

YES >> Go to EC-208, "Diagnosis Procedure".
NO >> INSPECTION END

# Diagnosis Procedure

INFOID:0000000004899992

## 1.CHECK OVERALL FUNCTION-I

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | | Voltage |
|---|---|---|---|---|---|
| Connector | + Terminal | - Terminal | | | |
| E16 | 100 (ASCD brake switch signal) | 108 | Brake pedal (CVT) Brake pedal and clutch pedal (M/T) | Slightly depressed | Approx. 0V |
| | | | | Fully released | Battery voltage |

Is the inspection result normal?

YES >> GO TO 2.
NO >> GO TO 3.

## 2.CHECK OVERALL FUNCTION-II

Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | | Voltage |
|---|---|---|---|---|---|
| Connector | + Terminal | - Terminal | | | |
| E16 | 99 (Stop lamp switch signal) | 108 | Brake pedal | Slightly depressed | Battery voltage |
| | | | | Fully released | Approx. 0V |

Is the inspection result normal?

YES >> GO TO 16.
NO >> GO TO 11.

## 3.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.

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4. Check the voltage between ASCD brake switch harness connector and ground.

| ASCD brake switch | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E112 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 9.
NO-1 >> CVT models: GO TO 4.
NO-2 >> M/T models: GO TO 5.

## 4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E105, M77
- 10 A fuse (No.4)
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 5. CHECK ASCD CLUTCH SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD clutch switch harness connector and ground.

| ASCD clutch switch | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E111 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

## 6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E105, M77
- 10 A fuse (No.4)
- Harness for open or short between ASCD clutch switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 7. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD clutch switch harness connector and ASCD brake switch harness connector.

| ASCD clutch switch | | ASCD brake switch | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E111 | 2 | E112 | 1 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 8. CHECK ASCD CLUTCH SWITCH



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# P1572 ASCD BRAKE SWITCH



Refer to EC-211, "Component Inspection (ASCD Clutch Switch)".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace ASCD clutch switch.

## 9. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

| ASCD brake switch | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E112 | 2 | E16 | 100 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 10. CHECK ASCD BRAKE SWITCH

Refer to EC-211, "Component Inspection (ASCD Brake Switch)".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace ASCD brake switch.

## 11. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the voltage between stop lamp switch harness connector and ground.

| Stop lamp switch | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E114 (M/T)<br>E115 (CVT) | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

## 12. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E105, M77
- 10A fuse (No.11)
- Harness for open or short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 13. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between ECM harness connector and stop lamp switch harness connector.

| ECM | | Stop lamp switch | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E16 | 99 | E114 (M/T)<br>E115 (CVT) | 2 | Existed |

3. Also check harness for short to ground and short to power.



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Is the inspection result normal?

YES >> GO TO 15.
NG >> GO TO 14.

## 14. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 15. CHECK STOP LAMP SWITCH

Refer to EC-212, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace stop lamp switch.

## 16. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection (ASCD Brake Switch)

INFOID:0000000004899993

## 1. CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2. CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to BR-8, "Inspection and Adjustment" (LHD), BR-52, "Inspection and Adjustment"(RHD).
2. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD brake switch.

## Component Inspection (ASCD Clutch Switch)

INFOID:0000000004899994

## 1. CHECK ASCD CLUTCH SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Check the continuity between ASCD clutch switch terminals under the following conditions.

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| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.CHECK ASCD CLUTCH SWITCH-II

1. Adjust ASCD clutch switch installation.
2. Check the continuity between ASCD clutch switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD clutch switch.

## Component Inspection (Stop Lamp Switch)

INFOID:0000000004899995

## 1.CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| | | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-8, "Inspection and Adjustment" (LHD), BR-52, "Inspection and Adjustment"(RHD).
2. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| | | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch.



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# P1574 ASCD VEHICLE SPEED SENSOR

## Description

INFOID:0000000004899996

The ECM receives two vehicle speed sensor signals via CAN communication line. One is sent from combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to EC-44, "System Description" for ASCD functions.

## DTC Logic

INFOID:0000000004899997

### DTC DETECTION LOGIC

**NOTE:**

- **If DTC P1574 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-87, "DTC Logic".**
- **If DTC P1574 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to EC-88, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-161, "DTC Logic"**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-162, "DTC Logic"**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1574 | ASCD vehicle speed sensor | ECM detects a difference between two vehicle speed signals is out of the specified range. | • Harness or connectors (The CAN communication line is open or shorted.)<br>• ABS actuator and electric unit (control unit)<br>• TCM<br>• ECM |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Drive the vehicle at more than 40 km/h (25 MPH).
   **CAUTION:**
   **Always drive vehicle at a safe speed.**
   **NOTE:**
   **This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.**
3. Check DTC.

Is DTC detected?

YES >> Go to EC-213, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004899998

#### 1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-36, "Diagnosis Description".

Is DTC detected?

NO >> GO TO 2.
YES >> Perform trouble shooting relevant to DTC indicated.

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## 2.CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to BRC-49, "Diagnostic Work Sheet".

Is DTC detected?

NO >> INSPECTION END
YES >> Perform trouble shooting relevant to DTC indicated.

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# P1706 PNP SWITCH

## Description

INFOID:0000000004899999

When the shift lever position is P or N (CVT), Neutral position (M/T), park/neutral position (PNP) switch is ON. ECM detects the position because the continuity of the line (the ON signal) exists.

## DTC Logic

INFOID:0000000004900000

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1706 | Park/neutral position switch | The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving. | • Harness or connectors (PNP switch circuit is open or shorted.)<br>• PNP switch |

## Component Function Check

INFOID:0000000004900001

### 1.PERFORM COMPONENT FUNCTION CHECK

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector and ground.

| ECM | | | | Condition | | Voltage |
|---|---|---|---|---|---|---|
| + | | - | | | | |
| Connector | Terminal | Connector | Terminal | | | |
| F8 | 69 (PNP switch signal) | E16 | 108 | Shift lever | P or N (CVT) Neutral (M/T) | Battery voltage |
| | | | | | Except above | Approx. 0V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-215, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004900002

### 1.CHECK PNP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect park/neutral position (PNP) switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between PNP switch harness connector and ground.

| PNP switch | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F21 (CVT) | 7 | Ground | Battery voltage |
| F46 [M/T (2WD)] | 2 | | |
| F48 [M/T (4WD)] | 2 | | |

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

### 2.DTECTED MALFUNCTIONING PART

Check the following.
- Harness connectors E6, F123
- Harness for open or short between PNP switch and IPDM E/R



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>> Repair open circuit or short to ground or short to power in harness or connectors.

## 3. CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between PNP switch harness connector and ECM harness connector.

| PNP switch | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F21 (CVT) | 6 | F8 | 69 | Existed |
| F46 [M/T (2WD)] | 3 | | | |
| F48 [M/T (4WD)] | 1 | | | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4. CHECK PNP SWITCH

Refer to TM-4, "Work Flow".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace PNP switch.

## 5. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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# P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

## Description

INFOID:0000000004900003

ECM receives primary speed sensor signal from TCM through CAN communication line. ECM uses this signal for engine control.

## DTC Logic

INFOID:0000000004900004

### DTC DETECTION LOGIC

**NOTE:**

- **If DTC P1715 is displayed with DTC U1000 or U1001 first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-87, "DTC Logic".**
- **If DTC P1715 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to EC-88, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0335, first perform the trouble diagnosis for DTC P0335. Refer to EC-147, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0340, first perform the trouble diagnosis for DTC P0340. Refer to EC-151, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-162, "DTC Logic".**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1715 | Input speed sensor (Primary speed sensor) (TCM output) | Primary speed sensor signal is different from the theoretical value calculated by ECM from secondary speed sensor signal and engine rpm signal. | • Harness or connectors (The CAN communication line is open or shorted)<br>• Harness or connectors (Primary speed sensor circuit is open or shorted)<br>• TCM |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and drive the vehicle at more than 50 km/h (31 MPH) for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-217, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004900005

#### 1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-36, "Diagnosis Description".

Is DTC detected?

NO >> GO TO 2.
YES >> Perform trouble shooting relevant to DTC indicated.

#### 2.REPLACE TCM

Replace TCM.

>> INSPECTION END

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# P1805 BRAKE SWITCH

## Description

INFOID:0000000004900006

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

## DTC Logic

INFOID:0000000004900007

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1805 | Brake switch | A brake switch signal is not sent to ECM for extremely long time while the vehicle is driving. | • Harness or connectors (Stop lamp switch circuit is open or shorted.)<br>• Stop lamp switch |

### DTC CONFIRMATION PROCEDURE

#### 1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase DTC.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-218, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004900008

#### 1.CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Check the stop lamp when depressing and releasing the brake pedal.

| Brake pedal | Stop lamp |
|---|---|
| Fully released | Not illuminated |
| Slightly depressed | Illuminated |

Is the inspection result normal?

YES >> GO TO 4
NO >> GO TO 2

#### 2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.
2. Check the voltage between stop lamp switch harness connector and ground.

| Stop lamp switch | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E114 (M/T) | 1 | Ground | Battery voltage |
| E115 (CVT) | | | |

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

#### 3.DETECT MALFUNCTIONING PART

Check the following.

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- Harness connectors E105, M77
- 10A fuse (No.11)
- Harness for open or short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between ECM harness connector and stop lamp switch harness connector.

| ECM | | Stop lamp switch | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E16 | 99 | E114 (M/T)<br>E115 (CVT) | 2 | Existed |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NG >> GO TO 5.

## 5.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 6.CHECK STOP LAMP SWITCH

Refer to EC-219, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace stop lamp switch.

## 7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection (Stop Lamp Switch)

INFOID:0000000004900009

## 1.CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| | | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-8, "Inspection and Adjustment" (LHD), BR-52, "Inspection and Adjustment"(RHD).
2. Check the continuity between stop lamp switch terminals under the following conditions.



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| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| | | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch.

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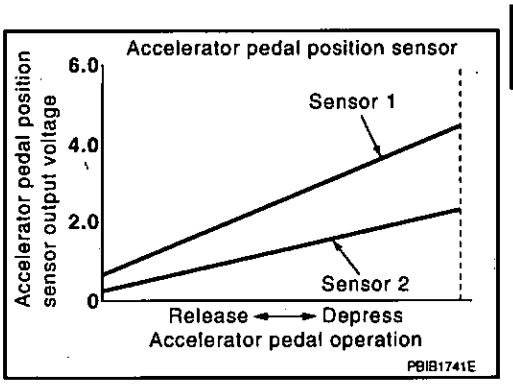
# P2122, P2123 APP SENSOR

## Description

INFOID:0000000004900010

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.




Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

## DTC Logic

INFOID:0000000004900011

### DTC DETECTION LOGIC

**NOTE:**
**If DTC P2122 or P2123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-202, "DTC Logic".**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P2122 | Accelerator pedal position sensor 1 circuit low input | An excessively low voltage from the APP sensor 1 is sent to ECM. | • Harness or connectors (APP sensor 1 circuit is open or shorted.)<br>• Accelerator pedal position sensor (APP sensor 1) |
| P2123 | Accelerator pedal position sensor 1 circuit high input | An excessively high voltage from the APP sensor 1 is sent to ECM. | |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 8V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-221, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004900012

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

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NO >> Repair or replace ground connection.

## 2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

| APP sensor | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E110 | 4 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 3.CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E110 | 2 | E16 | 111 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E110 | 3 | E16 | 110 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK APP SENSOR

Refer to EC-223, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

## 6.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-223, "Special Repair Requirement".

>> INSPECTION END

## 7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000004900013

### 1. CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| E16 | 110 (APP sensor 1 signal) | 111 | Accelerator pedal: Fully released | 0.6 - 0.9V |
| | | | Accelerator pedal: Fully depressed | 3.9 - 4.7V |
| | 103 (APP sensor 2 signal) | 104 | Accelerator pedal: Fully released | 0.3 - 0.6V |
| | | | Accelerator pedal: Fully depressed | 1.95 - 2.4V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

### 2. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-223, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

INFOID:0000000004900014

### 1. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-14, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

### 2. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

### 3. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

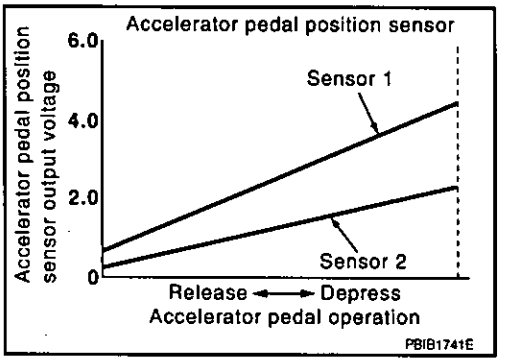
>> END

# P2127, P2128 APP SENSOR

## Description

INFOID:0000000004900015

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.




## DTC Logic

INFOID:0000000004900016

### DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P2127 | Accelerator pedal position sensor 2 circuit low input | An excessively low voltage from the APP sensor 2 is sent to ECM. | • Harness or connectors (APP sensor 2 circuit is open or shorted.) [Crankshaft position sensor (POS) circuit is shorted.] (Refrigerant pressure sensor circuit is shorted.)<br>• Accelerator pedal position sensor (APP sensor 2)<br>• Crankshaft position sensor (POS)<br>• Refrigerant pressure sensor |
| P2128 | Accelerator pedal position sensor 2 circuit high input | An excessively high voltage from the APP sensor 2 is sent to ECM. | |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 8V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-224, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004900017

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

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NO >> Repair or replace ground connection.

## 2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

| APP sensor | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E110 | 5 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 3.

## 3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E110 | 5 | E16 | 102 | Existed |

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit.

## 4. CHECK SENSOR POWER SUPPLY CIRCUITS

Check harness for short to power and short to ground, between the following terminals.

| ECM | | Sensor | | |
|---|---|---|---|---|
| Connector | Terminal | Item | Connector | Terminal |
| F8 | 74 | Refrigerant pressure sensor | E49 | 3 |
| | 75 | CKP sensor (POS) | F20 | 1 |
| E16 | 102 | APP sensor | E110 | 5 |

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

## 5. CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (POS) (Refer to EC-150, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-256, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace malfunctioning component.

## 6. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

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| APP sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E110 | 1 | E16 | 104 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 7.CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E110 | 6 | E16 | 103 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 8.CHECK APP SENSOR

Refer to EC-226, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

## 9.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-227, "Special Repair Requirement".

>> INSPECTION END

## 10.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection

INFOID:0000000004900018

## 1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| E16 | 110 (APP sensor 1 signal) | 111 | Accelerator pedal: Fully released | 0.6 - 0.9V |
| | | | Accelerator pedal: Fully depressed | 3.9 - 4.7V |
| | 103 (APP sensor 2 signal) | 104 | Accelerator pedal: Fully released | 0.3 - 0.6V |
| | | | Accelerator pedal: Fully depressed | 1.95 - 2.4V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-227, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

INFOID:0000000004900019

## 1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-14, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

## 2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

## 3.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

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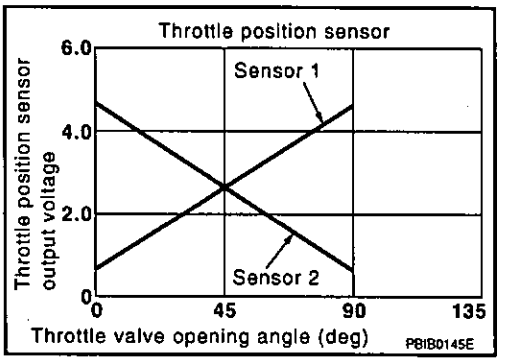
# P2135 TP SENSOR

## Description

INFOID:0000000004900020

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.




## DTC Logic

INFOID:0000000004900021

### DTC DETECTION LOGIC

**NOTE:**
**If DTC P2135 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-202, "DTC Logic".**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P2135 | Throttle position sensor circuit range/performance | Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2. | • Harness or connector (TP sensor 1 and 2 circuit is open or shorted.)<br>• Electric throttle control actuator (TP sensor 1 and 2) |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 8V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-228, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004900022

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

#### 2.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.

2. Turn ignition switch ON.
3. Check the voltage between electric throttle control actuator harness connector and ground.

| Electric throttle control actuator | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F29 | 1 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 3.CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| Electric throttle control actuator | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F29 | 4 | F8 | 36 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| Electric throttle control actuator | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F29 | 2 | F8 | 33 | Existed |
| F29 | 3 | F8 | 34 | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK THROTTLE POSITION SENSOR

Refer to EC-230, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

## 6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. EC-230, "Special Repair Requirement"

>> INSPECTION END

## 7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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## Component Inspection

INFOID:0000000004900023

### 1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
4. Turn ignition switch ON.
5. Set shift lever to D (CVT) or 1st (M/T) position.
6. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| F8 | 33 (TP sensor 1 signal) | 36 | Accelerator pedal: Fully released | More than 0.36V |
| | | | Accelerator pedal: Fully depressed | Less than 4.75V |
| | 34 (TP sensor 2 signal) | | Accelerator pedal: Fully released | Less than 4.75V |
| | | | Accelerator pedal: Fully depressed | More than 0.36V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

### 2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to EC-230, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

INFOID:0000000004900024

### 1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

### 2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END



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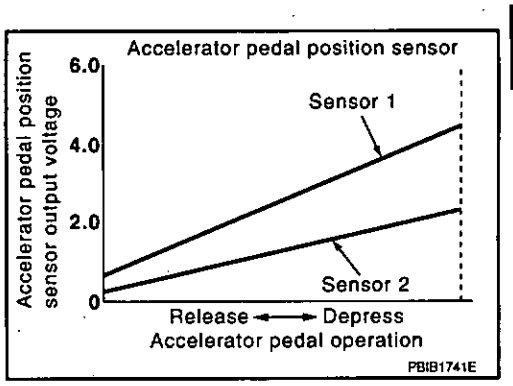
# P2138 APP SENSOR

## Description

INFOID:0000000004900025

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.




## DTC Logic

INFOID:0000000004900026

### DTC DETECTION LOGIC

**NOTE:**
**If DTC P2138 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to EC-202, "DTC Logic".**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P2138 | Accelerator pedal position sensor circuit range/ performance | Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2. | • Harness or connector (APP sensor 1 and 2 circuit is open or shorted.) [Crankshaft position sensor (POS) circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.)<br>• Accelerator pedal position sensor (APP sensor 1 and 2)<br>• Crankshaft position sensor (POS)<br>• Refrigerant pressure sensor |

### DTC CONFIRMATION PROCEDURE

#### 1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**

>> GO TO 2.

#### 2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-231, "Diagnosis Procedure".
NO >> INSPECTION END

## Diagnosis Procedure

INFOID:0000000004900027

#### 1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

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# P2138 APP SENSOR



2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

## 2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

| APP sensor | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E110 | 4 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or shot to power in harness or connectors.

## 3.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

Check the voltage between APP sensor harness connector and ground.

| APP sensor | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E110 | 5 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

## 4.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E110 | 5 | E16 | 102 | Existed |

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit.

## 5.CHECK SENSOR POWER SUPPLY CIRCUITS

Check harness for short to power and short to ground, between the following terminals.

| ECM | | Sensor | | |
|---|---|---|---|---|
| Connector | Terminal | Item | Connector | Terminal |
| F8 | 74 | Refrigerant pressure sensor | E49 | 3 |
| | 75 | CKP sensor (POS) | F20 | 1 |
| E16 | 102 | APP sensor | E110 | 5 |

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair short to ground or short to power in harness or connectors.

## 6.CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-150, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-256, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace malfunctioning component.

## 7.CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E110 | 2 | E16 | 111 | Existed |
| | 1 | | 104 | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit or short to ground or shot to power in harness or connectors.

## 8.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E110 | 3 | E16 | 110 | Existed |
| | 6 | | 103 | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit or short to ground or shot to power in harness or connectors.

## 9.CHECK APP SENSOR

Refer to EC-233, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

## 10.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-234, "Special Repair Requirement".

>> INSPECTION END

## 11.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

# Component Inspection

INFOID:0000000004900028

## 1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.

3. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage |
|---|---|---|---|---|
| Connector | + | - | | |
| | Terminal | Terminal | | |
| E16 | 110 (APP sensor 1 signal) | 111 | Accelerator pedal: Fully released | 0.6 - 0.9V |
| | | | Accelerator pedal: Fully depressed | 3.9 - 4.7V |
| | 103 (APP sensor 2 signal) | 104 | Accelerator pedal: Fully released | 0.3 - 0.6V |
| | | | Accelerator pedal: Fully depressed | 1.95 - 2.4V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-234, "Special Repair Requirement".

>> INSPECTION END

## Special Repair Requirement

INFOID:0000000004900029

## 1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-14, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

## 2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-15, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

## 3.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-15, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

# ASCD BRAKE SWITCH

## Description

INFOID:0000000004900030

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal).
Refer to EC-44, "System Description" for the ASCD function.

## Component Function Check

INFOID:0000000004900031

### 1.CHECK FOR ASCD BRAKE SWITCH FUNCTION

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | | Voltage |
|---|---|---|---|---|---|
| Connector | + | - | | | |
| | Terminal | Terminal | | | |
| E16 | 100 (ASCD brake switch signal) | 108 | Brake pedal (CVT)<br>Brake pedal and clutch pedal (M/T) | Slightly depressed | Approx. 0V |
| | | | | Fully released | Battery voltage |

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to EC-235, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004900032

### 1.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

| ASCD brake switch | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E112 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 7.
NO-1 >> CVT models: GO TO 2.
NO-2 >> M/T models: GO TO 3.

### 2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E105, M77
- 10 A fuse (No.4)
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

### 3.CHECK ASCD CLUTCH SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD clutch switch harness connector and ground.

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| ASCD clutch switch | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E111 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

## 4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E105, M77
- 10 A fuse (No.4)
- Harness for open or short between ASCD clutch switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD clutch switch harness connector and ASCD brake switch harness connector.

| ASCD clutch switch | | ASCD brake switch | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E111 | 2 | E112 | 1 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 6.CHECK ASCD CLUTCH SWITCH

Refer to EC-237, "Component Inspection (ASCD Clutch Switch)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace ASCD clutch switch.

## 7.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

| ASCD brake switch | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E112 | 2 | E16 | 100 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 8.CHECK ASCD BRAKE SWITCH

Refer to EC-237, "Component Inspection (ASCD Brake Switch)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace ASCD brake switch.



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## 9.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

## Component Inspection (ASCD Brake Switch)

INFOID:0000000004900033

## 1.CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to BR-8, "Inspection and Adjustment" (LHD), BR-52, "Inspection and Adjustment"(RHD).
2. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD brake switch.

## Component Inspection (ASCD Clutch Switch)

INFOID:0000000004900034

## 1.CHECK ASCD CLUTCH SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Check the continuity between ASCD clutch switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

## 2.CHECK ASCD CLUTCH SWITCH-II

1. Adjust ASCD clutch switch installation.
2. Check the continuity between ASCD clutch switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---|---|---|---|
| 1 and 2 | Clutch pedal | Fully released | Existed |
| | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD clutch switch.

# ASCD INDICATOR

## Description

INFOID:0000000004900035

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.
CRUISE lamp illuminates when MAIN switch on ASCD steering switch is turned ON to indicated that ASCD system is ready for operation.
SET lamp illuminates when following conditions are met.

- CRUISE lamp is illuminated.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of ASCD setting.

SET lamp remains lit during ASCD control.
Refer to EC-44, "System Description" for the ASCD function.

## Component Function Check

INFOID:0000000004900036

### 1.ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

| ASCD INDICATOR | CONDITION | | SPECIFICATION |
|---|---|---|---|
| CRUISE LAMP | • Ignition switch: ON | • MAIN switch: Pressed at the 1st time →at the 2nd time | ON → OFF |
| SET LAMP | • MAIN switch: ON<br>• When vehicle speed: Between 40 km/h (25 MPH) and 190 km/h (118 MPH) (For the Middle East), 40 km/h (25 MPH) and 160 km/h (100 MPH) (Except for the Middle East) | • ASCD: Operating | ON |
| | | • ASCD: Not operating | OFF |

Is the inspection result normal?
YES >> INSPECTION END
NO >> Go to EC-239, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004900037

### 1.CHECK DTC

Check that DTC U1000 or U1001 is not displayed.
Is DTC detected?
NO >> GO TO 2.
YES >> Perform trouble diagnosis for DTC U1000, U1001. Refer to EC-87, "DTC Logic".

### 2.CHECK COMBINATION METER OPERATION

Refer to MWI-22, "Diagnosis Description".
Is the inspection result normal?
YES >> GO TO 3.
NO >> Check combination meter circuit. Refer to MWI-16, "WARNING LAMPS/INDICATOR LAMPS : System Diagram".

### 3.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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# COOLING FAN

## Description

INFOID:0000000004900038

### COOLING FAN MOTOR

Cooling fan operates when the current flows.
Refer to EC-52, "System Diagram" for cooling fan operation.

## Component Function Check

INFOID:0000000004900039

### 1.CHECK COOLING FAN LOW SPEED FUNCTION

1. Start engine and let it idle.
2. Turn air conditioner switch and blower fan switch ON.
3. Make sure that cooling fan operates at low speed.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Check cooling fan low speed control circuit. Refer to EC-240, "Diagnosis Procedure".

### 2.CHECK COOLING FAN HIGH SPEED FUNCTION

1. Turn ignition switch OFF.
2. Turn air conditioner switch and blower fan switch OFF.
3. Disconnect engine coolant temperature sensor harness connector.
4. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
5. Restart engine and make sure that cooling fan operates at higher speed than low speed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Check cooling fan high speed control circuit. Refer to EC-240, "Diagnosis Procedure"

## Diagnosis Procedure

INFOID:0000000004900040

### 1.CHECK COOLING FAN MOTOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect cooling fan motor harness connector.
3. Check the continuity between cooling fan motor harness connector and ground.

| Cooling fan motor | | Ground | Continuity |
|---|---|---|---|
| Connector | Terminal | | |
| E3 | 2 | Ground | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit or short to power in harness connectors.

### 2.CHECK COOLING FAN LOW SPEED CIRCUIT FOR OPEN AND SHORT

1. Disconnect IPDM E/R harness connector.
2. Check the continuity between IPDM E/R harness connector and cooling fan motor harness connector.

| IPDM E/R | | Cooling fan motor | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E14 | 52 | E3 | 1 | Existed |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

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## 3. DETECT MALFUNCTIONING PART

Check the following.
- Resistor E57
- Harness for open or short between IPDM E/R and cooling fan motor

>> Repair or replace malfunctioning part.

## 4. CHECK COOLING FAN HIGH SPEED CIRCUIT-I

1. Disconnect cooling fan relay-3 harness connector.
2. Check the voltage cooling fan relay-3 harness connector and ground.

| cooling fan relay-3 | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E59 | 1 | Ground | Battery voltage |
| | 3 | | |

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

## 5. DETECT MALFUNCTIONING PART

Check the following.
- 50 A fusible link (letter M)
- Harness for open or short between cooling fan relay-3 and battery

>> Repair or replace malfunctioning part.

## 6. CHECK COOLING FAN HIGH SPEED CIRCUIT-II

1. Disconnect IPDM E/R harness connector.
2. Check the continuity between cooling fan relay-3 harness connector and IPDM E/R harness connector.

| Cooling fan relay-3 | | IPDM E/R | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E59 | 4 | E13 | 48 | Existed |

3. Check the continuity between cooling fan relay-3 harness connector and cooling fan motor harness connector.

| Cooling fan relay-3 | | Cooling fan motor | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E59 | 2 | E3 | 1 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 7.

## 7. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between cooling fan relay-3 and IPDM E/R
- Harness for open or short between cooling fan relay-3 and cooling fan motor

>> Repair open circuit or short to ground or short to power in harness connectors.

## 8. CHECK COOLING FAN RELAY-3

Refer to EC-242, "Component Inspection (Cooling Fan Relay)".



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Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace cooling fan relay-3.

## 9.CHECK COOLING FAN MOTOR

Refer to EC-242, "Component Inspection (Cooling Fan Motor)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace cooling fan motor.

## 10.CHECK INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connector.

## Component Inspection (Cooling Fan Motor)

INFOID:0000000004900041

## 1.CHECK COOLING FAN MOTOR

1. Turn ignition switch OFF.
2. Disconnect cooling fan motor harness connector.
3. Supply cooling fan motor terminal with battery voltage and check operation.

| Terminals | | Operation |
|---|---|---|
| (+) | (−) | |
| 1 | 2 | Cooling fan operates |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace cooling fan motor.

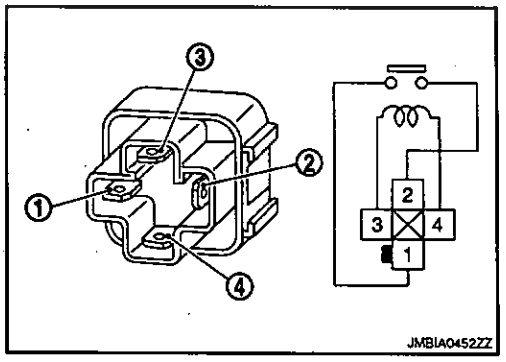
## Component Inspection (Cooling Fan Relay)

INFOID:0000000004900042

## 1.CHECK COOLING FAN RELAY-3

1. Turn ignition switch OFF.
2. Remove cooling fan relay-3.
3. Check the continuity between cooling fan relay-3 terminals under the following conditions.

| Terminals | Conditions | Continuity |
|---|---|---|
| 1 and 2 | 12V direct current supply between terminals 3 and 4 | Existed |
| | No current supply | Not existed |



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Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace cooling fan relay-3.

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# ELECTRICAL LOAD SIGNAL

## Description

INFOID:0000000004900043

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred through the CAN communication line.

## Diagnosis Procedure

INFOID:0000000004900045

### 1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan).

Which circuit is related to the incident?

Rear window defogger>>GO TO 2
Headlamp>>GO TO 3.
Heater fan>>GO TO 4.

### 2.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to DEF-2, "System Diagram".

>> INSPECTION END

### 3.CHECK HEADLAMP SYSTEM

Refer to EXL-6, "System Diagram" (XENON TYPE) or EXL-123, "System Diagram" (HALOGEN TYPE).

>> INSPECTION END

### 4.CHECK HEATER FAN CONTROL SYSTEM

Refer to HAC-4, "Work Flow" (AUTOMATIC A/C) or HAC-123, "Work Flow" (MANUAL A/C).

>> INSPECTION END

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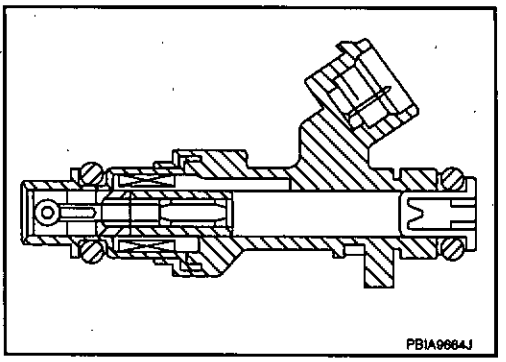
# FUEL INJECTOR

## Description

INFOID:0000000004900046

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the coil in the fuel injector is energized. The energized coil pulls the ball valve back and allows fuel to flow through the fuel injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the fuel injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.




## Component Function Check

INFOID:0000000004900047

### 1.INSPECTION START

Turn ignition switch to START.

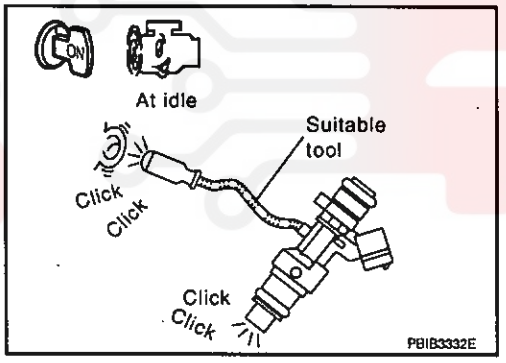
Is any cylinder ignited?

YES >> GO TO 2.
NO >> Go to EC-244, "Diagnosis Procedure".

### 2.CHECK FUEL INJECTOR FUNCTION

1. Let engine idle.
2. Listen to each fuel injector operating sound.

**Clicking noise should be heard.**




Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-244, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004900048

### 1.CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Turn ignition switch ON.
4. Check the voltage between fuel injector harness connector and ground.

| Fuel injector | | | Ground | Voltage |
|---|---|---|---|---|
| Cylinder | Connector | Terminal | | |
| 1 | F37 | 1 | Ground | Battery voltage |
| 2 | F38 | 1 | | |
| 3 | F39 | 1 | | |
| 4 | F40 | 1 | | |

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

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## 2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- 10A fuse (No. 58)
- Harness for open or short between fuel injector and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 3.CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel injector harness connector and ECM harness connector.

| Fuel injector | | | ECM | | Continuity |
|---|---|---|---|---|---|
| Cylinder | Connector | Terminal | Connector | Terminal | |
| 1 | F37 | 2 | F7 | 31 | Existed |
| 2 | F38 | 2 | | 30 | |
| 3 | F39 | 2 | | 29 | |
| 4 | F40 | 2 | | 25 | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 4.CHECK FUEL INJECTOR

Refer to EC-245, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning fuel injector.

## 5.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

## Component Inspection

INFOID:0000000004900049

## 1.CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Check resistance between fuel injector terminals as follows.

| Terminals | Resistance |
|---|---|
| 1 and 2 | 11.1 - 14.5Ω [at 10 - 60°C (50 - 140°F)] |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning fuel injector.

# FUEL PUMP

## Description

INFOID:0000000004900050

| Sensor | Input signal to ECM | ECM Function | Actuator |
|---|---|---|---|
| Crankshaft position sensor (POS)<br>Camshaft position sensor (PHASE) | Engine speed* | Fuel pump control | Fuel pump relay<br>↓<br>Fuel pump |
| Battery | Battery voltage* | | |

*: ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine startability. If the ECM receives a engine speed signal from the camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

| Condition | Fuel pump operation |
|---|---|
| Ignition switch is turned to ON | Operates for 1 second |
| Engine running and cranking | Operates |
| When engine is stopped | Stops in 1.5 seconds |
| Except as shown above | Stops |

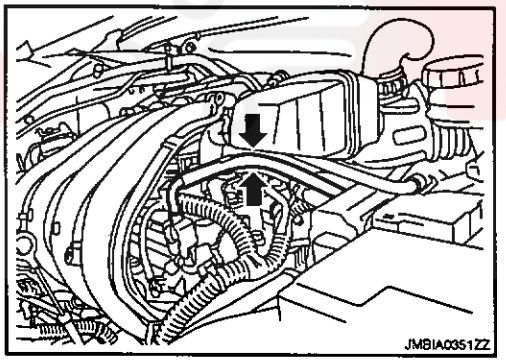
## Component Function Check

INFOID:0000000004900051

### 1.CHECK FUEL PUMP FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose with two fingers.

**Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.**




Is the inspection result normal?

YES >> INSPECTION END
NO >> EC-246, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004900052

### 1.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ECM harness connector and ground.

| ECM | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F7 | 23 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 2.

### 2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between IPDM E/R harness connector and ECM harness connector.

| ECM | | IPDM E/R | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| F7 | 23 | E13 | 33 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 3.

## 3. DETECT MALFUNCTIONING PART

Check the following.
- Harness or connectors E6, F123.
- Harness for open or short between IPDM E/R and ECM

>> Repair harness or connectors.

## 4. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect "fuel level sensor unit and fuel pump" harness connector.
4. Turn ignition switch ON.
5. Check voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

| Fuel level sensor unit and fuel pump | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| B40 | 1 | Ground | Battery voltage should exist 1 second after ignition switch is turn ON. |

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 5.

## 5. CHECK 15A FUSE

1. Turn ignition switch OFF.
2. Disconnect 15A fuse (No. 57) from IPDM E/R.
3. Check 15A fuse.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace fuse.

## 6. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV

1. Disconnect IPDM E/R harness connector.
2. Check the continuity between IPDM E/R harness connector and "fuel level sensor unit and fuel pump" harness connector.

| IPDM E/R | | Fuel level sensor unit and fuel pump | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E13 | 42 | B40 | 1 | Existed |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 7.

## 7.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B11, E101
- Harness for open or short between IPDM E/R and "fuel level sensor unit and fuel pump"

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 8.CHECK FUEL PUMP GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between "fuel level sensor unit and fuel pump" and ground.

| Fuel level sensor unit and fuel pump | | Ground | Continuity |
|---|---|---|---|
| Connector | Terminal | | |
| B40 | 3 | Ground | Existed |

3. Also heck harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit or short to power in harness or connectors.

## 9.CHECK FUEL PUMP

Refer to EC-248, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace fuel pump.

## 10.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

## Component Inspection

INFOID:0000000004900053

## 1.CHECK FUEL PUMP

1. Turn ignition switch OFF.
2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
3. Check resistance between "fuel level sensor unit and fuel pump" terminals as follows.

| Terminals | Resistance |
|---|---|
| 3 and 5 | 0.2 - 5.0Ω [at 25°C (77°F)] |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace "fuel level sensor unit and fuel pump".

# IGNITION SIGNAL

## Description

INFOID:0000000004900054

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.

## Component Function Check

INFOID:0000000004900055

### 1.INSPECTION START

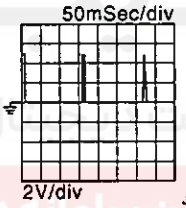
Turn ignition switch OFF, and restart engine.

Does the engine start?

YES >> GO TO 2.
NO >> Go to EC-249, "Diagnosis Procedure".

### 2.IGNITION SIGNAL FUNCTION

1. Let engine idle.
2. Read the voltage signal between ECM harness connector terminals with an oscilloscope.

| ECM | | | | Voltage signal |
|---|---|---|---|---|
| + | | - | | |
| Connector | Terminal | Connector | Terminal | |
| F7 | 17 | E16 | 108 |  |
| | 18 | | | |
| | 21 | | | |
| | 22 | | | |



**NOTE:**
The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-249, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004900056

### 1.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
2. Check the voltage between ECM harness connector and ground.

| ECM | | | Voltage |
|---|---|---|---|
| Connector | + | - | |
| | Terminal | Terminal | |
| E16 | 105 | 108 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-84, "Diagnosis Procedure".

### 2.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Turn ignition switch ON.

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4. Check the voltage between condenser harness connector and ground.

| Condenser | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| F13 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 3.

## 3.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

| IPDM E/R | | Condenser | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E11 | 10 | F13 | 1 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 4.

## 4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E7, F121
- Harness for open or short between IPDM E/R and condenser

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 5.CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between condenser harness connector and ground.

| Condenser | | Ground | Continuity |
|---|---|---|---|
| Connector | Terminal | | |
| F13 | 2 | Ground | Existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 6.CHECK CONDENSER

Refer to EC-252, "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 7.
NG >> Replace condenser.

## 7.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Reconnect all harness connectors disconnected.
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ignition coil harness connector and ground.

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| Ignition coil | | | Ground | Voltage |
|---|---|---|---|---|
| Cylinder | Connector | Terminal | | |
| 1 | F33 | 3 | Ground | Battery voltage |
| 2 | F34 | 3 | | |
| 3 | F35 | 3 | | |
| 4 | F36 | 3 | | |

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 8. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between ignition coil harness connector and ground.

| Ignition coil | | | Ground | Continuity |
|---|---|---|---|---|
| Cylinder | Connector | Terminal | | |
| 1 | F33 | 2 | Ground | Existed |
| 2 | F34 | 2 | | |
| 3 | F35 | 2 | | |
| 4 | F36 | 2 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit or short to power in harness or connectors.

## 9. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between ECM harness connector and ignition coil harness connector.

| Ignition coil | | | ECM | | Continuity |
|---|---|---|---|---|---|
| Cylinder | Connector | Terminal | Connector | Terminal | |
| 1 | F33 | 1 | F7 | 17 | Existed |
| 2 | F34 | 1 | | 18 | |
| 3 | F35 | 1 | | 22 | |
| 4 | F36 | 1 | | 21 | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

## 10. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-252, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace malfunctioning ignition coil with power transistor.

## 11. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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## Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000004900057

### 1.CHECK IGNITION COIL WITH POWER TRANSISTOR-I

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as follows.

| Terminals | Resistance |
|---|---|
| 1 and 2 | Except 0 or ∞ Ω [at 25°C (77°F)] |
| 1 and 3 | Except 0 Ω [at 25°C (77°F)] |
| 2 and 3 | |

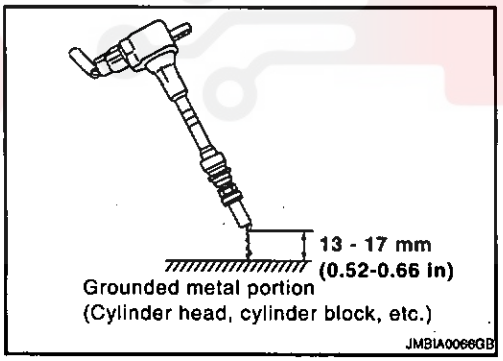
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning ignition coil with power transistor.

### 2.CHECK IGNITION COIL WITH POWER TRANSISTOR-II

**CAUTION:**
**Do the following procedure in the place where ventilation is good without the combustible.**

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Remove fuel pump fuse in IPDM E/R to release fuel pressure.
4. Start engine.
5. After engine stalls, crank it two or three times to release all fuel pressure.
6. Turn ignition switch OFF.
7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
8. Remove ignition coil and spark plug of the cylinder to be checked.
9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
10. Connect spark plug and harness connector to ignition coil.
11. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
12. Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded metal portion.




**Spark should be generated.**

**CAUTION:**

- **Do not approach to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20kV or more.**
- **It might cause to damage the ignition coil if the gap of more than 17 mm 0.66 in) is taken.**

**NOTE:**
**When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.**

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning ignition coil with power transistor.

## Component Inspection (Condenser)

INFOID:0000000004900058

### 1.CHECK CONDENSER

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals as follows.



021-62999292

| Terminals | Resistance |
|---|---|
| 1 and 2 | Above 1 MΩ [at 25°C (77°F)] |

Is the inspection result normal?

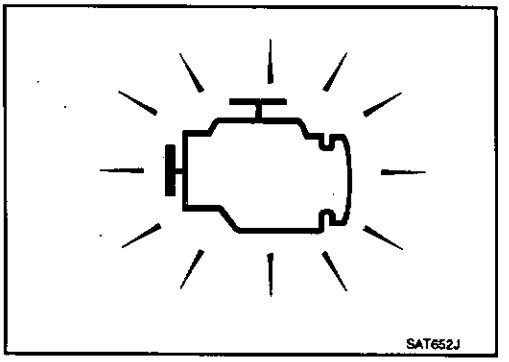
YES >> INSPECTION END
NO >> Replace condenser.

# MALFUNCTION INDICATOR LAMP

## Description

INFOID:0000000004900059

The Malfunction Indicator (MIL) is located on the combination meter.
The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
When the engine is started, the MIL should go off. If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.
For details, refer to EC-254, "Diagnosis Procedure".




## Component Function Check

INFOID:0000000004900060

### 1.CHECK MIL FUNCTION

1. Turn ignition switch ON.
2. Make sure that MIL lights up.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-254, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004900061

### 1.CHECK DTC

Check that DTC U1000 or U1001 is not displayed.

Is DTC detected?

NO >> GO TO 2.
YES >> Perform trouble diagnosis for DTC U1000, U1001. Refer to EC-87, "Diagnosis Procedure".

### 2.CHECK DTC WITH COMBINATION METER

Refer to MWI-3, "METER SYSTEM : System Diagram".

Is DTC detected?

NO >> GO TO 3.
YES >> Perform trouble shooting relevant to DTC indicated.

### 3.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

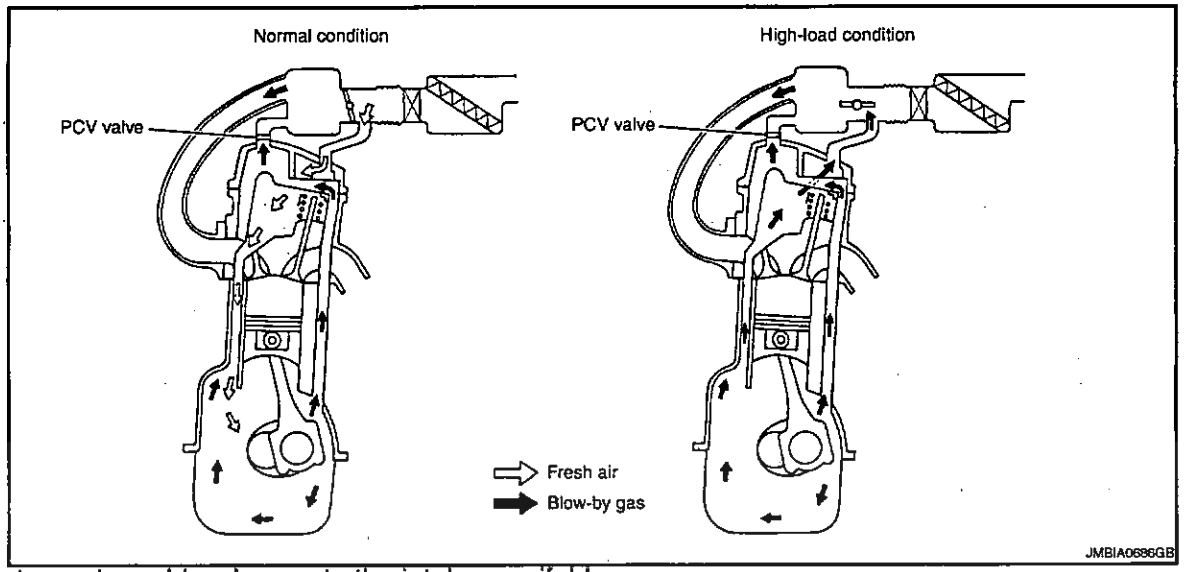
Is the inspection result normal?

YES >> Replace combination meter.
NO >> Repair or replace.

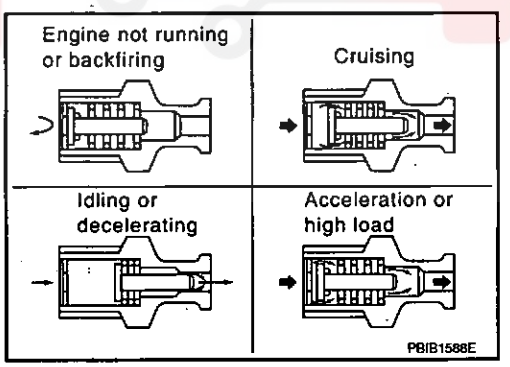
# POSITIVE CRANKCASE VENTILATION

## Description

INFOID:0000000004900062




This system returns blow-by gas to the intake manifold.
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.
The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve.
The flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.




## Component Inspection

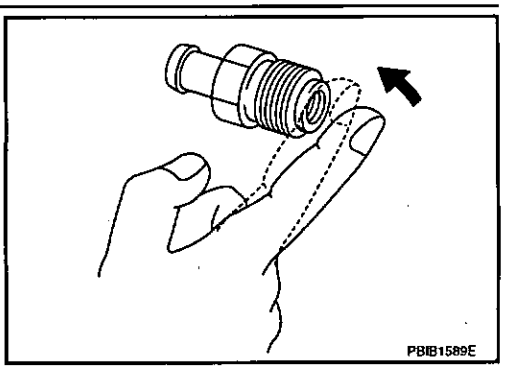
INFOID:0000000004900063

### 1.CHECK PCV VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace PCV valve.



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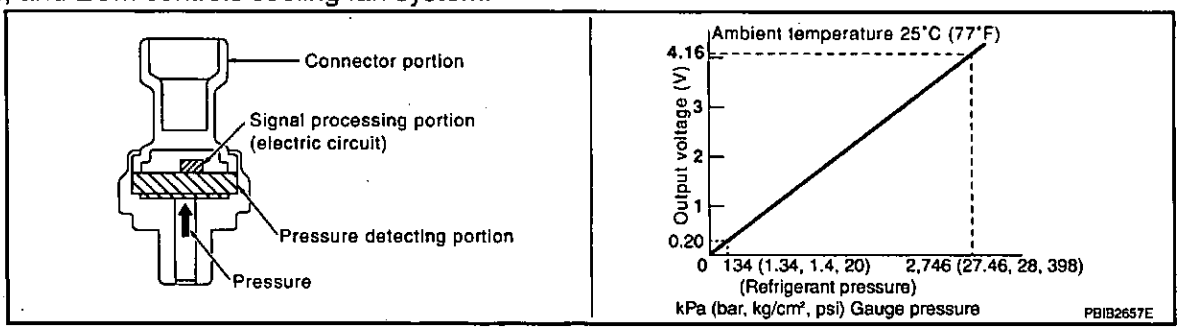
# REFRIGERANT PRESSURE SENSOR

## Description

INFOID:0000000004900064

The refrigerant pressure sensor is installed at the condenser of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.




## Component Function Check

INFOID:0000000004900065

### 1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower fan switch ON.
3. Check the voltage between ECM harness connector terminals.

| ECM | | | |
|---|---|---|---|
| Connector | + | - | Voltage |
| | Terminal | Terminal | |
| F8 | 41 (Refrigerant pressure sensor signal) | 48 | 1.0 - 4.0V |

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-256, "Diagnosis Procedure".

## Diagnosis Procedure

INFOID:0000000004900066

### 1. CHECK GROUND CONNECTION

1. Turn A/C switch and blower fan switch OFF.
2. Stop engine and turn ignition switch OFF.
3. Check ground connection E21 and E38. Refer to Ground Inspection in GI-40, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

### 2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect refrigerant pressure sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between refrigerant pressure sensor harness connector and ground.

| Refrigerant pressure sensor | | Ground | Voltage |
|---|---|---|---|
| Connector | Terminal | | |
| E49 | 3 | Ground | Approx. 5V |

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

## 3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E6, F123
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

| Refrigerant pressure sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E49 | 1 | F8 | 48 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

## 5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E6, F123
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

| Refrigerant pressure sensor | | ECM | | Continuity |
|---|---|---|---|---|
| Connector | Terminal | Connector | Terminal | |
| E49 | 2 | F8 | 41 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 7.

## 7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E6, F123
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

## 8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor.
NO >> Repair or replace.

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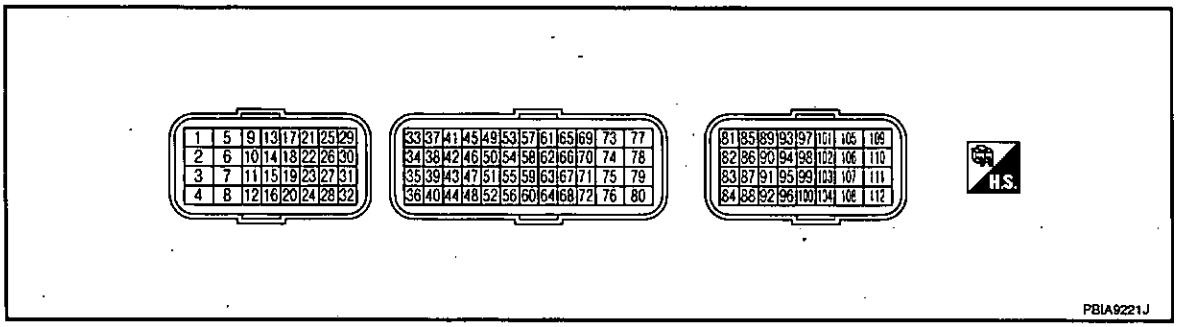
# ECU DIAGNOSIS

## ECM

### Reference Value

INFOID:0000000004900067

TERMINAL LAYOUT

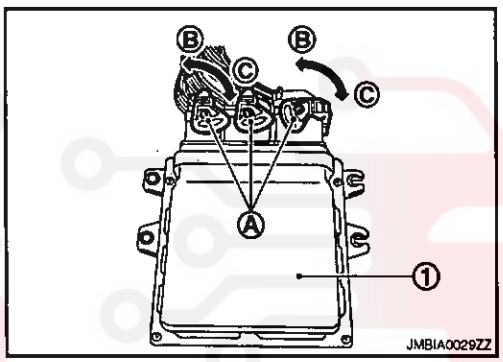



PHYSICAL VALUES

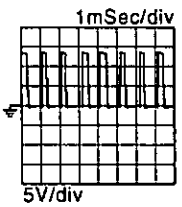
**NOTE:**

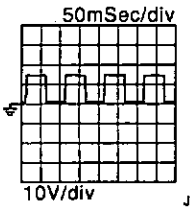
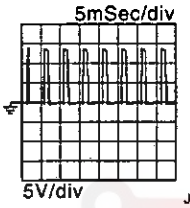
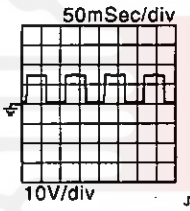
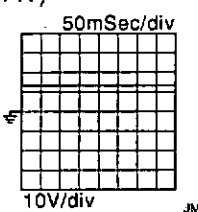
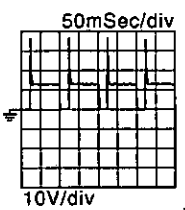
- ECM is located in the engine room left side near battery.
- When disconnecting ECM harness connector (A), loosen (C) it with levers as far as they will go as shown in the figure.

1 : ECM
B : Fasten




- Connect a break-out box [SST (EG17550000)] and harness adapter [SST (EG17680000)] between the ECM and ECM harness connector.
- Use extreme care not to touch 2 pins at one time.
- Data is for comparison and may not be exact.
- Specification data are reference values and are measured between each terminals.

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|---|---|---|---|---|---|
| + | — | Signal name | Input/ Output | | |
| 1 (L/W) | 108 (B) | Throttle control motor (Open) | Output | [Ignition switch: ON]<br>• Engine stopped<br>• Shift lever: D (CVT), 1st (M/T)<br>• Accelerator pedal: Fully depressed | 0 – 14 V★<br>  <br><br>JMBIA0324GB |
| 2 (R/Y) | 108 (B) | Throttle control motor relay power supply | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 – 14 V) |

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|---|---|---|---|---|---|
| + | − | Signal name | Input/ Output | | |
| 3 (L/G) | 108 (B) | Heated oxygen sensor 1 heater | Output | [Engine is running]<br>• Warm-up condition<br>• Engine speed: Below 3,400 rpm | 10 V★<br>  <br> |
| | | | | [Ignition switch: ON]<br>• Engine stopped<br>[Engine is running]<br>• Engine speed: Above 3,400 rpm | BATTERY VOLTAGE<br>(11 – 14 V) |
| 4 (P) | 108 (B) | Throttle control motor (Close) | Output | [Ignition switch: ON]<br>• Engine stopped<br>• Shift lever: D (CVT), 1st (M/T)<br>• Accelerator pedal: Fully released | 0 – 14 V★<br>  <br> |
| 5 (R) | 108 (B) | Heated oxygen sensor 2 heater | Output | [Engine is running]<br>• Engine speed: Below 3,600 rpm after the following conditions are met<br>- Engine: after warming up<br>- Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 10 V★<br>  <br> |
| | | | | [Ignition switch: ON]<br>• Engine stopped<br>[Engine is running]<br>• Engine speed: Above 3,600 rpm | BATTERY VOLTAGE<br>(11 – 14 V) |
| 9 (W/B) | 108 (B) | EVAP canister purge volume control solenoid valve | Output | [Engine is running]<br>• Idle speed | BATTERY VOLTAGE<br>(11 – 14V)★<br>  <br> |
| | | | | [Engine is running]<br>• Engine speed: About 2,000 rpm (More than 100 seconds after starting engine.) | 10 V★<br>  <br> |
| 10 (B) | — | ECM ground | — | — | — |
| 11 (B/W) | — | ECM ground | — | — | — |

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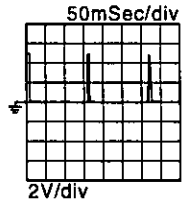
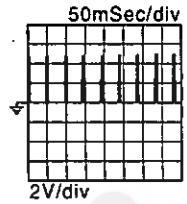
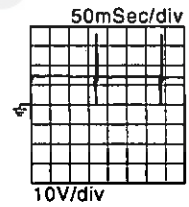
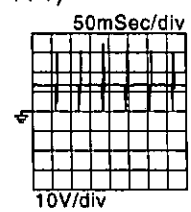
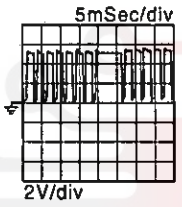
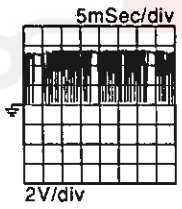
| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|---|---|---|---|---|---|
| + | — | Signal name | Input/ Output | | |
| 15 (G/L) | 108 (B) | Throttle control motor relay | Output | [Ignition switch: OFF] | BATTERY VOLTAGE (11 – 14 V) |
| | | | | [Ignition switch: ON] | 0 – 1.0 V |
| 17 (L/Y) | 108 (B) | Ignition signal No. 1 | Output | [Engine is running]<br>• Warm-up condition<br>• Idle speed<br>**NOTE:**<br>The pulse cycle changes depending on rpm at idle | 0 – 0.3 V★<br>  <br><br>JMBIA0329GB |
| 18 (BR/Y) | | Ignition signal No. 2 | | | |
| 21 (R/G) | | Ignition signal No. 4 | | [Engine is running]<br>• Warm-up condition<br>• Engine speed: 2,500 rpm | 0.2 – 0.5 V★<br>  <br><br>JMBIA0330GB |
| 22 (Y) | | Ignition signal No. 3 | | | |
| 23 (B/O) | 108 (B) | Fuel pump relay | Output | [Ignition switch: ON]<br>• For 1 second after turning ignition switch ON<br>[Engine is running] | 0 – 1.0 V |
| | | | | [Ignition switch: ON]<br>• More than 1 second after turning ignition switch ON | BATTERY VOLTAGE (11 – 14 V) |
| 25 (R/O) | 108 (B) | Fuel injector No. 4 | Output | [Engine is running]<br>• Warm-up condition<br>• Idle speed<br>**NOTE:**<br>The pulse cycle changes depending on rpm at idle | BATTERY VOLTAGE (11 – 14 V)★<br>  <br><br>JMBIA0331GB |
| 29 (O) | | Fuel injector No. 3 | | | |
| 30 (GR) | | Fuel injector No. 2 | | [Engine is running]<br>• Warm-up condition<br>• Engine speed: 2,000 rpm | BATTERY VOLTAGE (11 – 14 V)★<br>  <br><br>JMBIA0332GB |
| 31 (L) | | Fuel injector No. 1 | | | |
| 32 (Y/L) | 108 (B) | ECM relay (Self shut-off) | Output | [Engine is running]<br>[Ignition switch: OFF]<br>• A few seconds after turning ignition switch OFF | 0 – 1.0 V |
| | | | | [Ignition switch: OFF]<br>• More than a few seconds after turning ignition switch OFF | BATTERY VOLTAGE (11 – 14 V) |





021-62999292

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|---|---|---|---|---|---|
| + | − | Signal name | Input/ Output | | |
| 33 (V/W) | 36 (B) | Throttle position sensor 1 | Input | [Ignition switch: ON]<br>• Engine stopped<br>• Shift lever: D (CVT), 1st (M/T)<br>• Accelerator pedal: Fully released | More than 0.36 V |
| | | | | [Ignition switch: ON]<br>• Engine stopped<br>• Shift lever: D (CVT), 1st (M/T)<br>• Accelerator pedal: Fully depressed | Less than 4.75 V |
| 34 (L/R) | 36 (B) | Throttle position sensor 2 | Input | [Ignition switch: ON]<br>• Engine stopped<br>• Shift lever: D (CVT), 1st (M/T)<br>• Accelerator pedal: Fully released | Less than 4.75 V |
| | | | | [Ignition switch: ON]<br>• Engine stopped<br>• Shift lever: D (CVT), 1st (M/T)<br>• Accelerator pedal: Fully depressed | More than 0.36 V |
| 36 (B) | — | Sensor ground (Throttle position sensor) | — | — | — |
| 37 (W) | 40 (B/W) | Knock sensor | Input | [Engine is running]<br>• Idle speed | 2.5 V |
| 38 (P) | 44 (W/G) | Engine coolant temperature sensor | Input | [Engine is running] | 0 – 4.8 V<br>Output voltage varies with engine coolant temperature. |
| 40 (B/W) | — | Sensor ground (Knock sensor) | — | — | — |
| 41 (G/P) | 48 (R/L) | Refrigerant pressure sensor | Input | [Engine is running]<br>• Warm-up condition<br>• Both A/C switch and blower fan motor switch: ON (Compressor operates) | 1.0 – 4.0 V |
| 44 (W/G) | — | Sensor ground (Engine coolant temperature sensor) | — | — | — |
| 45 (BR) | 52 (LG) | Mass air flow sensor | Input | [Ignition switch: ON]<br>• Engine stopped | 0.4 V |
| | | | | [Engine is running]<br>• Warm-up condition<br>• Idle speed | 0.9 – 1.1 V |
| | | | | [Engine is running]<br>• Warm-up condition<br>• Engine is revving from idle to about 4,000 rpm | 0.9 – 1.1 V to 2.4 V (Check for liner voltage rise in response to engine being increased to about 4,000 rpm |
| 46 (V) | 55 (O) | Intake air temperature sensor | Input | [Engine is running] | 0 – 4.8 V<br>Output voltage varies with intake air temperature. |
| 48 (R/L) | — | Sensor ground (Refrigerant pressure sensor) | — | — | — |
| 49 (LG/R) | 56 (B/V) | Heated oxygen sensor 1 | Input | [Engine is running]<br>• Warm-up condition<br>• Engine speed: 2,000 rpm | 0 – 1.0 V |

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|---|---|---|---|---|---|
| + | − | Signal name | Input/ Output | | |
| 50 (Y) | 59 (SB) | Heated oxygen sensor 2 | Input | [Engine is running]<br>• Revving engine from idle to 3,000 rpm quickly after the following conditions are met<br>- Engine: after warming up<br>- Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 0 – 1.0 V |
| 52 (LG) | — | Sensor ground (Mass air flow sensor) | — | — | — |
| 55 (O) | — | Sensor ground (Intake air temperature sensor) | — | — | — |
| 56 (B/V) | — | Sensor ground (Heated oxygen sensor 1) | — | — | — |
| 59 (SB) | — | Sensor ground (Heated oxygen sensor 2) | — | — | — |
| 61 (LG/B) | 62 (B/O) | Crankshaft position sensor (POS) | Input | [Engine is running]<br>• Warm-up condition<br>• Idle speed<br>**NOTE:**<br>The pulse cycle changes depending on rpm at idle | 4.0 V★<br>  <br><br>JMBIA0333GB |
| | | | | [Engine is running]<br>• Engine speed: 2,000 rpm | 4.0 V★<br>  <br><br>JMBIA0334GB |
| 62 (B/O) | — | Sensor ground [Crankshaft position sensor (POS)] | — | — | — |
| 63 (B/L) | — | Sensor ground [Camshaft position sensor (PHASE)] | — | — | — |

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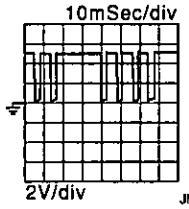
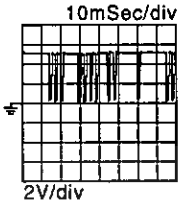
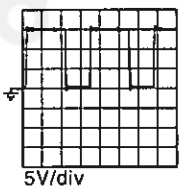
| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|---|---|---|---|---|---|
| + | − | Signal name | Input/ Output | | |
| 65 (GR/L) | 63 (B/L) | Camshaft position sensor (PHASE) | Input | [Engine is running]<br>• Warm-up condition<br>• Idle speed<br>**NOTE:**<br>The pulse cycle changes depending on rpm at idle | 4.0 V★<br>  <br> |
| | | | | [Engine is running]<br>• Engine speed is 2,000 rpm | 4.0 V★<br>  <br> |
| 69 (W/B) | 108 (B) | PNP switch | Input | [Ignition switch: ON]<br>• Shift lever: P or N (CVT), Neutral (M/T) | BATTERY VOLTAGE (11 – 14 V) |
| | | | | [Ignition switch: ON]<br>• Shift lever: Except above | 0 V |
| 72 (L/O) | 36 (B) | Sensor power supply (Throttle position sensor) | — | [Ignition switch: ON] | 5 V |
| 73 (Y/R) | 108 (B) | Intake valve timing control solenoid valve | Output | [Engine is running]<br>• Warm-up condition<br>• Idle speed | BATTERY VOLTAGE (11 – 14 V) |
| | | | | [Engine is running]<br>• Warm-up condition<br>• When revving engine up to 2,500 rpm quickly | 0 – 14 V★<br>  <br> |
| 74 (Y/W) | 48 (R/L) | Sensor power supply (Refrigerant pressure sensor) | — | [Ignition switch: ON] | 5 V |
| 75 (L/W) | 62 (B/O) | Sensor power supply [Crankshaft position sensor (POS)] | — | [Ignition switch: ON] | 5 V |
| 78 (Y/V) | 63 (B/L) | Sensor power supply [Camshaft position sensor (PHASE)] | — | [Ignition switch: ON] | 5 V |
| 83 (P) | — | CAN communication line | Input/ Output | — | — |
| 84 (L) | — | CAN communication line | Input/ Output | — | — |
| 88 (O) | — | Data link connector | Input/ Output | — | — |
| 93 (W/L) | 108 (B) | Ignition switch | Input | [Ignition switch: OFF] | 0 V |
| | | | | [Ignition switch: ON] | BATTERY VOLTAGE (11 – 14 V) |

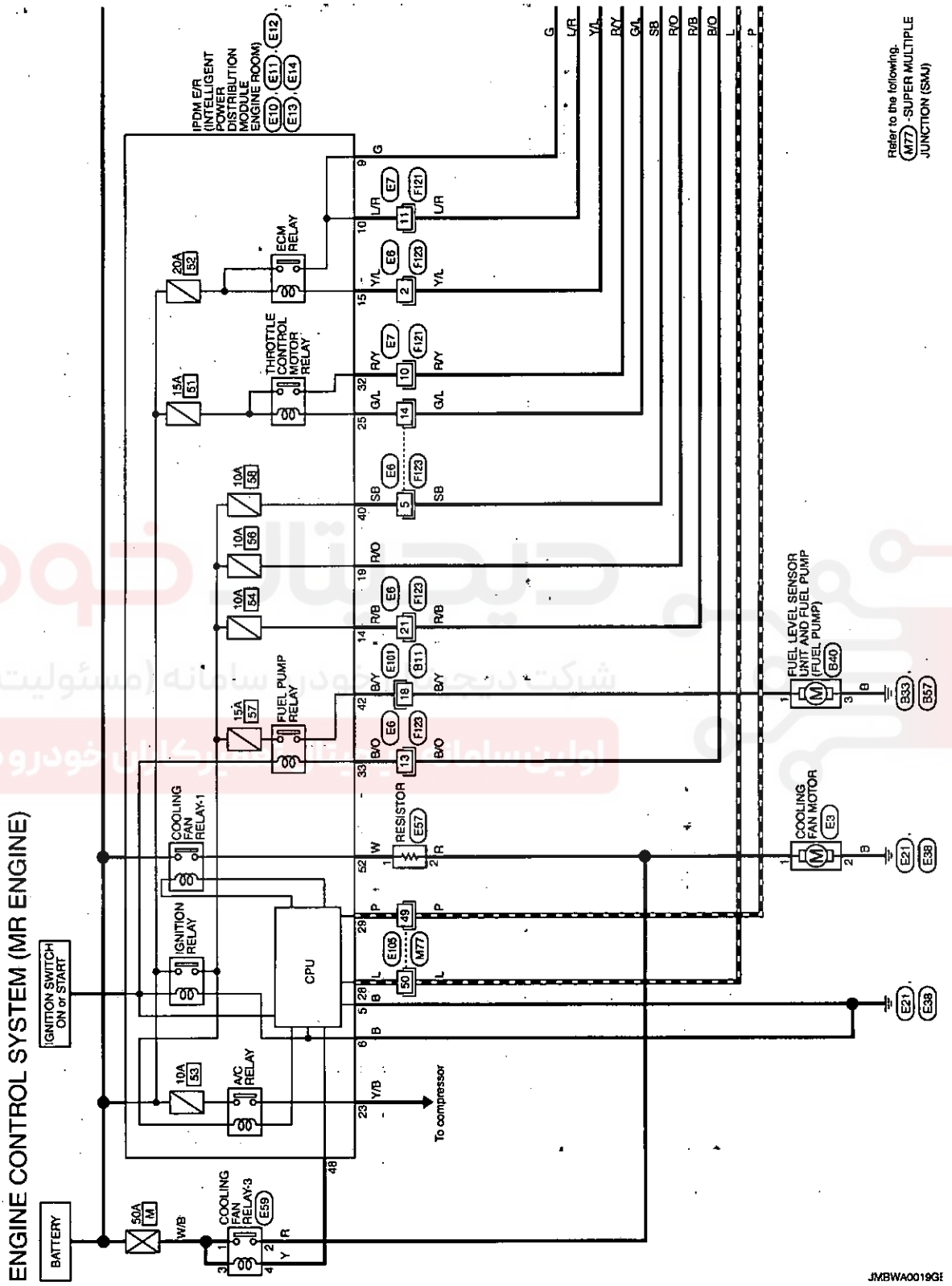
A EC C D E F G H I J K L M N O P

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|---|---|---|---|---|---|
| + | − | Signal name | Input/ Output | | |
| 94 (V) | 95 (B) | ASCD steering switch | Input | [Ignition switch: ON]<br>• ASCD steering switch: OFF | 4 V |
| | | | | [Ignition switch: ON]<br>• MAIN switch: Pressed | 0 V |
| | | | | [Ignition switch: ON]<br>• CANCEL switch: Pressed | 1 V |
| | | | | [Ignition switch: ON]<br>• RESUME/ACCELERATE switch: Pressed | 3 V |
| | | | | [Ignition switch: ON]<br>• SET/COAST switch: Pressed | 2 V |
| 95 (B) | — | Sensor ground (ASCD steering switch) | — | — | — |
| 99 (R/W) | 108 (B) | Stop lamp switch | Input | [Ignition switch: OFF]<br>• Brake pedal: Fully released | 0 V |
| | | | | [Ignition switch: OFF]<br>• Brake pedal: Slightly depressed | BATTERY VOLTAGE (11 – 14 V) |
| 100 (R) | 108 (B) | ASCD brake switch | Input | [Ignition switch: ON]<br>• Brake pedal: Slightly depressed (CVT)<br>• Brake pedal and/or clutch pedal: Slightly depressed (M/T) | 0V |
| | | | | [Ignition switch: ON]<br>• Brake pedal: Fully released (CVT)<br>• Brake pedal and clutch pedal: Fully released (M/T) | BATTERY VOLTAGE (11 – 14 V) |
| 102 (BR/Y) | 104 (B) | Sensor power supply (Accelerator pedal position sensor 2) | — | [Ignition switch: ON] | 5 V |
| 103 (GR) | 104 (B) | Accelerator pedal position sensor 2 | Input | [Ignition switch: ON]<br>• Engine stopped<br>• Accelerator pedal: Fully released | 0.3 – 0.6 V |
| | | | | [Ignition switch: ON]<br>• Engine stopped<br>• Accelerator pedal: Fully depressed | 1.95 – 2.4 V |
| 104 (B) | — | Sensor ground (Accelerator pedal position sensor 2) | — | — | — |
| 105 (G) | 108 (B) | Power supply for ECM | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 – 14 V) |
| 106 (O) | 111 (B/Y) | Sensor power supply (Accelerator pedal position sensor 1) | — | [Ignition switch: ON] | 5 V |
| 108 (B) | — | ECM ground | — | — | — |
| 110 (W) | 111 (B/Y) | Accelerator pedal position sensor 1 | Input | [Ignition switch: ON]<br>• Engine stopped<br>• Accelerator pedal: Fully released | 0.6 – 0.9 V |
| | | | | [Ignition switch: ON]<br>• Engine stopped<br>• Accelerator pedal: Fully depressed | 3.9 – 4.7 V |
| 111 (B/Y) | — | Sensor ground (Accelerator pedal position sensor 1) | — | — | — |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

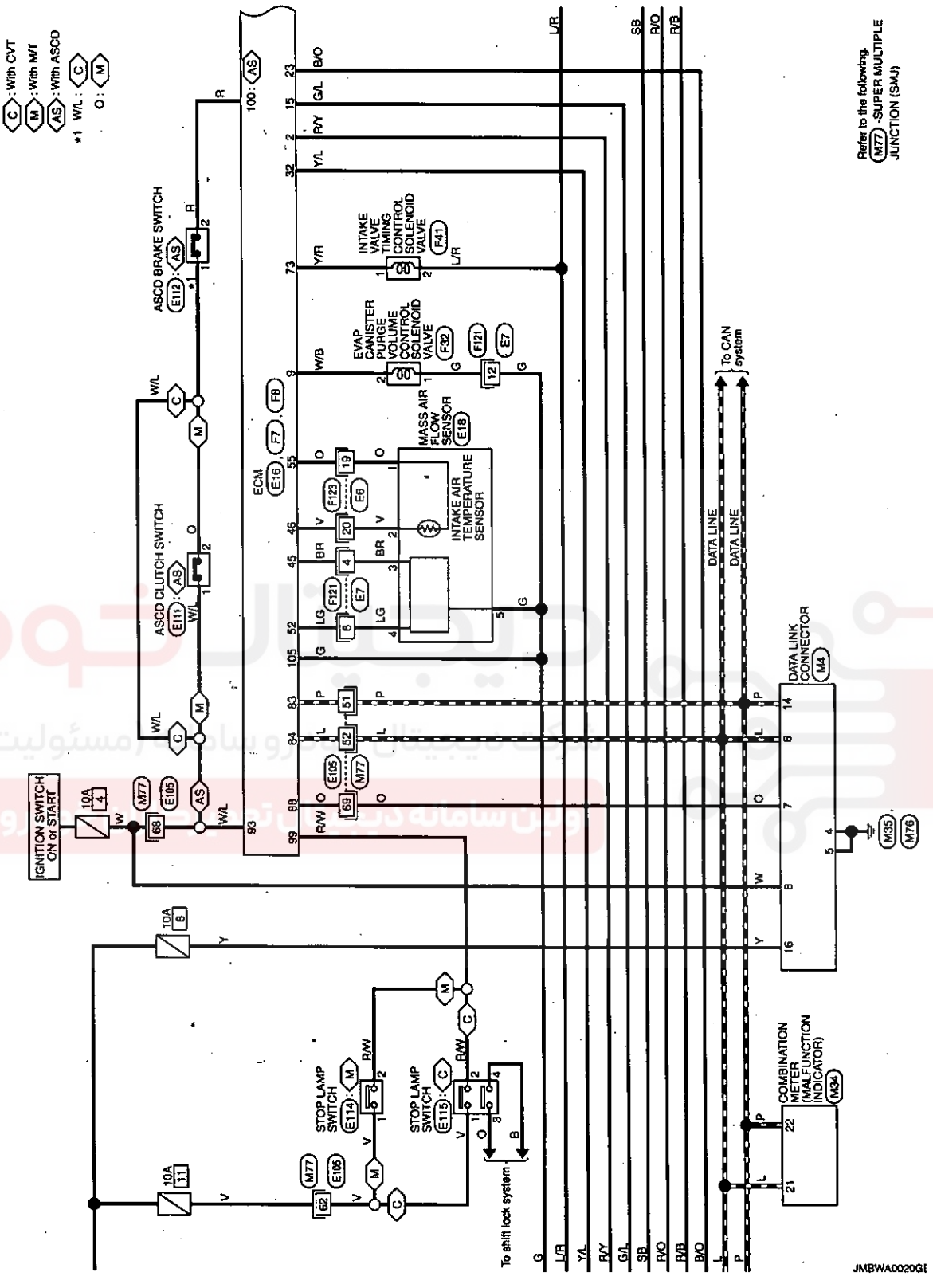
## Wiring Diagram - ENGINE CONTROL SYSTEM -

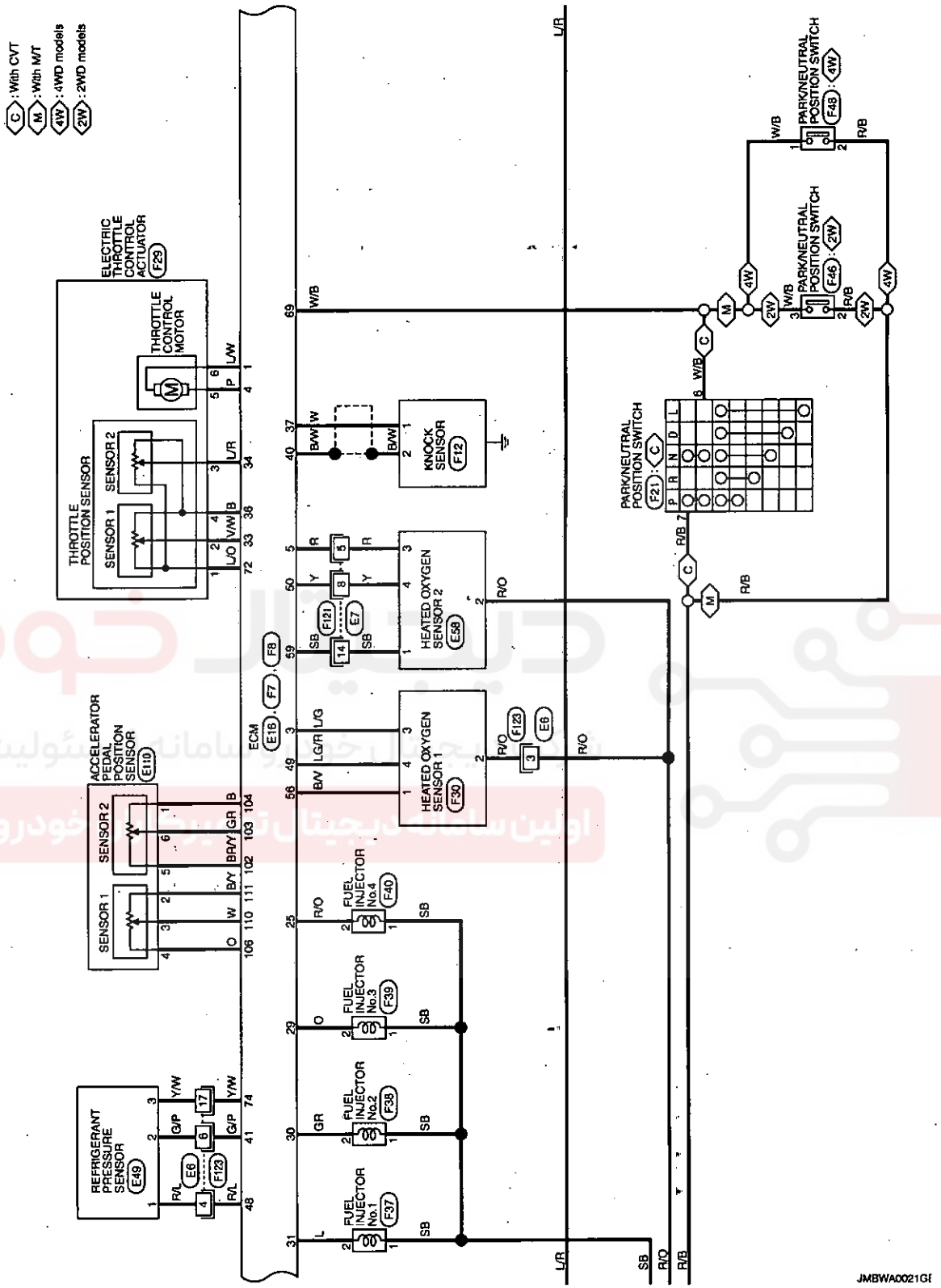
INFOID:0000000004900068



# ECM

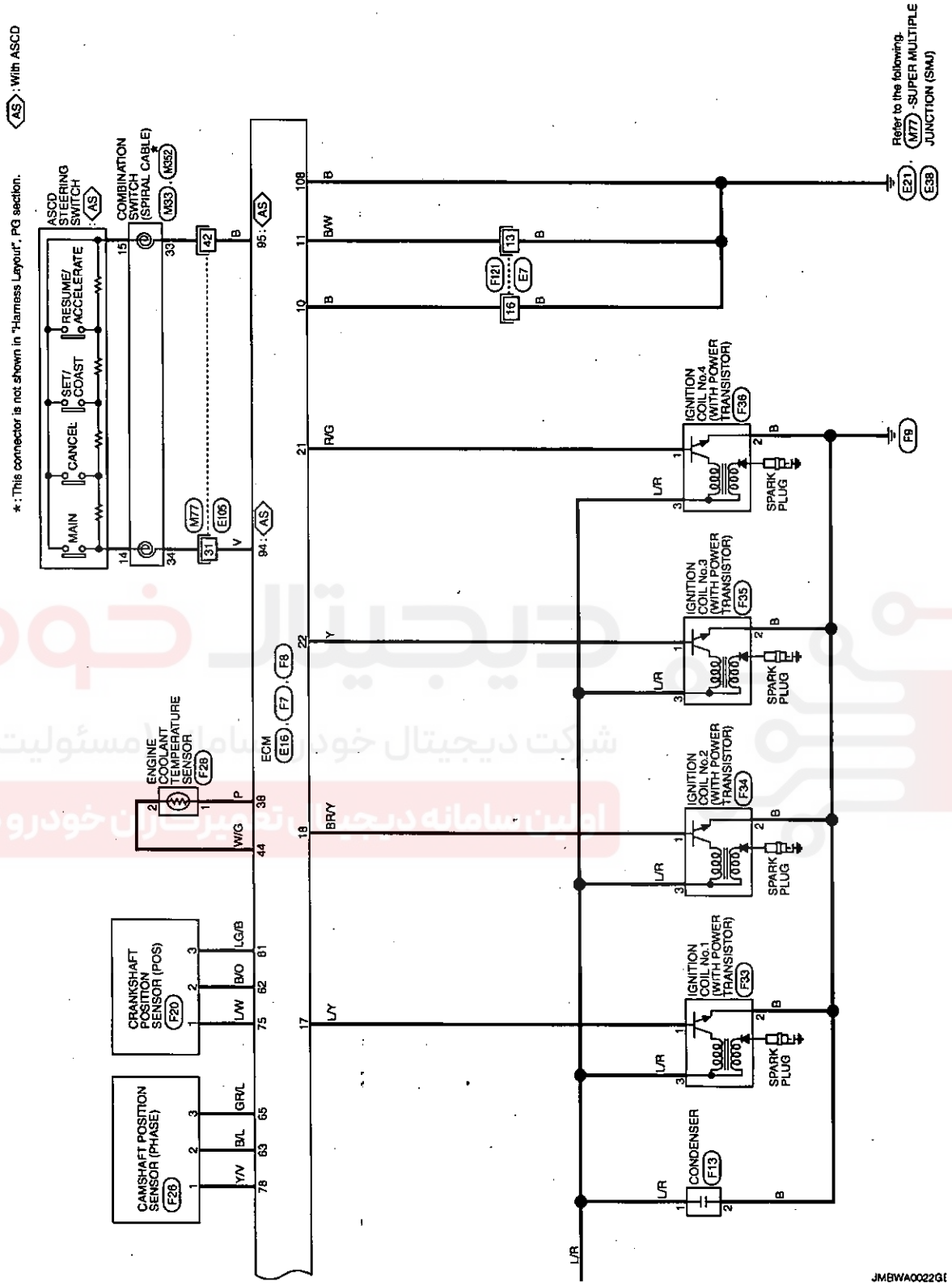


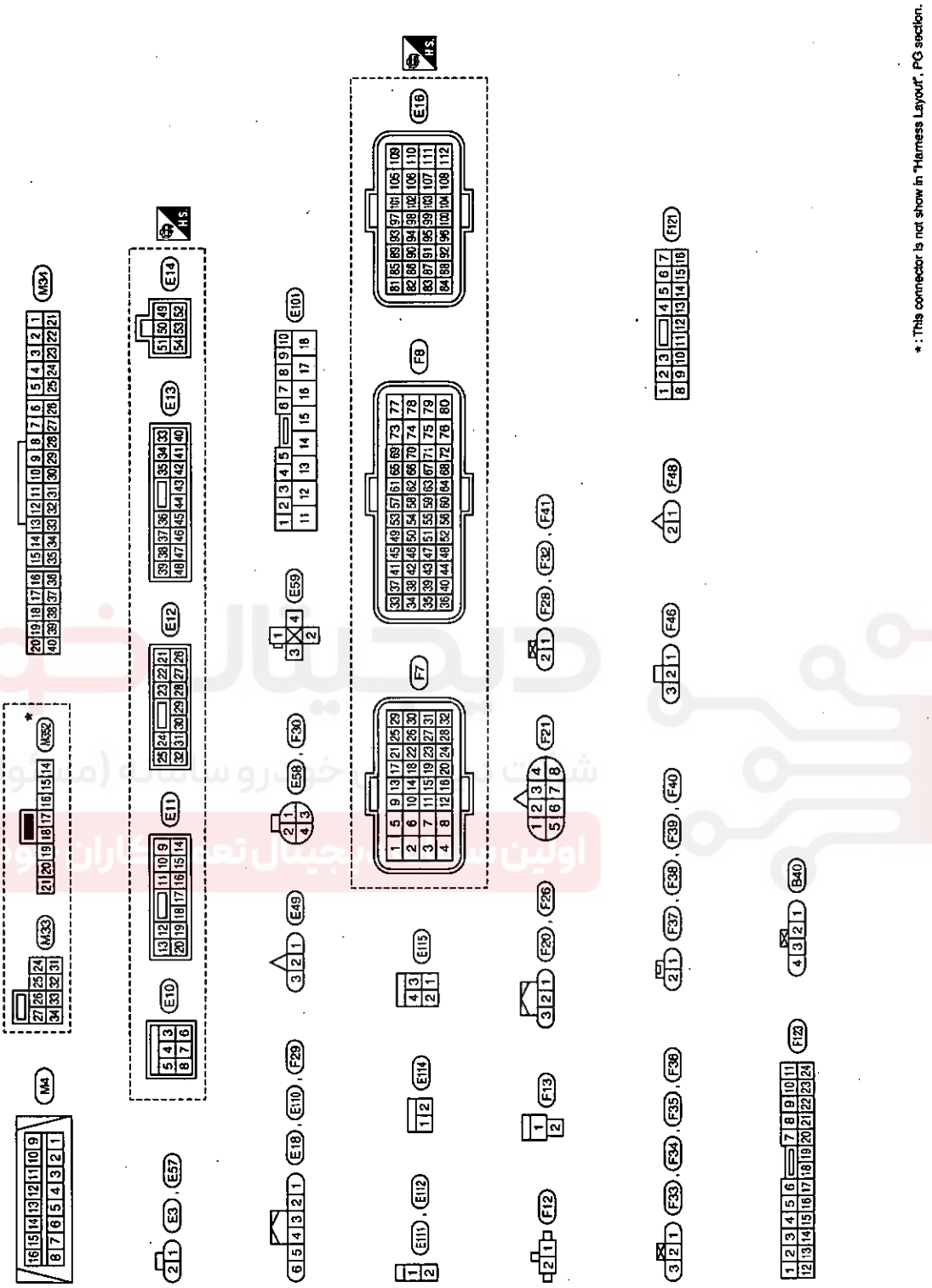




# ECM








## Fail Safe

NON DTC RELATED ITEM

| Engine operating condition in fail-safe mode | Detected items | Remarks | Reference page |
|---|---|---|---|
| Engine speed will not rise more than 2,500 rpm due to the fuel cut | Malfunction indicator circuit | When there is an open circuit on MIL circuit, the ECM cannot warn the driver by lighting up MIL when there is malfunction on engine control system.<br>Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating fail-safe function.<br>The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the malfunction. | EC-254 |

## DTC RELATED ITEM

| DTC No. | Detected items | Engine operating condition in fail-safe mode | |
|---|---|---|---|
| P0011 | Intake valve timing control | The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function. | |
| P0102<br>P0103 | Mass air flow sensor circuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. | |
| P0117<br>P0118 | Engine coolant temperature sensor circuit | Engine coolant temperature will be determined by ECM based on the following condition. | |
| | | Condition | Engine coolant temperature decided |
| | | Just as ignition switch is turned ON or START | 40°C (104°F) |
| | | Approx. 4 minutes or more after engine starting | 80°C (176°F) |
| | | Except as shown above | 40 - 80°C (104 - 176°F)<br>(Depends on the time) |
| | | When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running. | |
| P0122<br>P0123<br>P0222<br>P0223<br>P2135 | Throttle position sensor | The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.<br>The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.<br>So, the acceleration will be poor. | |
| P0500 | Vehicle speed sensor | When the fail-safe system for vehicle speed sensor is activated, the cooling fan operates (Highest) while engine is running. | |
| P0605 | ECM | (When ECM calculation function is malfunctioning:)<br>ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.<br>ECM deactivates ASCD operation. | |
| P1121 | Electric throttle control actuator | (When electric throttle control actuator does not function properly due to the return spring malfunction:)<br>ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm. | |
| | | (When throttle valve opening angle in fail-safe mode is not in specified range:)<br>ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less. | |
| | | (When ECM detects the throttle valve is stuck open:)<br>While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls.<br>The engine can restart in N or P (CVT), Neutral (M/T) position, and engine speed will not exceed 1,000 rpm or more. | |
| P1122 | Electric throttle control function | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | |
| P1124<br>P1126 | Throttle control motor relay | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | |

| DTC No. | Detected items | Engine operating condition in fail-safe mode |
|---|---|---|
| P1128 | Throttle control motor | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. |
| P1229 | Sensor power supply | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. |
| P1805 | Brake switch | ECM controls the electric throttle control actuator by regulating the throttle opening to a small range.<br>Therefore, acceleration will be poor. |
| | | Vehicle condition / Driving condition |
| | | When engine is idling / Normal |
| | | When accelerating / Poor acceleration |
| P2122<br>P2123<br>P2127<br>P2128<br>P2138 | Accelerator pedal position sensor | The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.<br>The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.<br>So, the acceleration will be poor. |

## DTC Inspection Priority Chart

INFOID:0000000004900070

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

| Priority | Detected items (DTC) |
|---|---|
| 1 | • U1000 U1001 CAN communication line<br>• U1010 CAN communication<br>• P0102 P0103 Mass air flow sensor<br>• P0112 P0113 Intake air temperature sensor<br>• P0117 P0118 Engine coolant temperature sensor<br>• P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor<br>• P0327 P0328 Knock sensor<br>• P0335 Crankshaft position sensor (POS)<br>• P0340 Camshaft position sensor (PHASE)<br>• P0500 Vehicle speed sensor<br>• P0605 ECM<br>• P0705 Park/neutral position (PNP) switch<br>• P1229 Sensor power supply<br>• P1610 - P1615 NATS<br>• P1706 Park/Neutral position (PNP) switch<br>• P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor |

| Priority | Detected items (DTC) |
|---|---|
| 2 | • P0132 P0133 P0134 P1143 P1144 Heated oxygen sensor 1<br>• P0135 Heated oxygen sensor 1 heater<br>• P0138 P0139 P1146 P1147 Heated oxygen sensor 2<br>• P0141 Heated oxygen sensor 2 heater<br>• P0444 EVAP canister purge volume control solenoid valve<br>• P0710 P0715 P0720 P0740 P0744 P0745 P0746 P0776 P0778 P0840 P0845 P1740 P1777 P1778 CVT related sensors, solenoid valves and switches<br>• P1111 Intake valve timing control solenoid valve<br>• P1122 Electric throttle control function<br>• P1124 P1126 Throttle control motor relay<br>• P1128 Throttle control motor<br>• P1217 Engine over temperature (OVERHEAT)<br>• P1805 Brake switch |
| 3 | • P0011 Intake valve timing control<br>• P0171 P0172 Fuel injection system function<br>• P0300 - P0304 Misfire<br>• P0420 Three way catalyst function<br>• P1121 Electric throttle motor actuator<br>• P1211 TCS control unit<br>• P1212 TCS communication line<br>• P1564 ASCD steering switch<br>• P1572 ASCD brake switch<br>• P1574 ASCD vehicle speed sensor<br>• P1715 Primary speed sensor |

## DTC Index

INFOID:0000000004900071

×:Applicable —: Not applicable

| DTC*1 | | Items | SRT code | Test value/ Test limit (GST only) | Trip | MIL | Reference page |
|---|---|---|---|---|---|---|---|
| GST*2 | ECM*3 | | | | | | |
| U1000 | 1000 | CAN COMM CIRCUIT | — | — | 1 | × | EC-87 |
| U1001 | 1001 | CAN COMM CIRCUIT | — | — | 2 | — | EC-87 |
| U1010 | 1010 | CONTROL UNIT(CAN) | — | — | 1 (CVT)<br>2 (M/T) | × (CVT)<br>— (M/T) | EC-88 |
| **P0000** | **0000** | **NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.** | — | — | — | **Flashing** | — |
| P0011 | 0011 | INT/V TIM CONT-B1 | — | — | 2 | — | EC-89 |
| P0102 | 0102 | MAF SEN/CIRCUIT-B1 | — | — | 1 | × | EC-92 |
| P0103 | 0103 | MAF SEN/CIRCUIT-B1 | — | — | 1 | × | EC-92 |
| P0112 | 0112 | IAT SEN/CIRCUIT-B1 | — | — | 2 | × | EC-96 |
| P0113 | 0113 | IAT SEN/CIRCUIT-B1 | — | — | 2 | × | EC-96 |
| P0117 | 0117 | ECT SEN/CIRC | — | — | 1 | × | EC-99 |
| P0118 | 0118 | ECT SEN/CIRC | — | — | 1 | × | EC-99 |
| P0122 | 0122 | TP SEN 2/CIRC-B1 | — | — | 1 | × | EC-102 |
| P0123 | 0123 | TP SEN 2/CIRC-B1 | — | — | 1 | × | EC-102 |
| P0132 | 0132 | HO2S1 (B1) | — | × | 2 | × | EC-105 |
| P0133 | 0133 | HO2S1 (B1) | × | × | 2 | × | EC-108 |
| P0134 | 0134 | HO2S1 (B1) | — | × | 2 | × | EC-112 |
| P0135 | 0135 | HO2S1 HTR (B1) | × | × | 2 | × | EC-115 |
| P0138 | 0138 | HO2S2 (B1) | — | × | 2 | × | EC-118 |
| P0139 | 0139 | HO2S2 (B1) | × | × | 2 | × | EC-122 |
| P0141 | 0141 | HO2S2 HTR (B1) | × | × | 2 | × | EC-126 |

| DTC*1 | | Items | SRT code | Test value/ Test limit (GST only) | Trip | MIL | Reference page |
|---|---|---|---|---|---|---|---|
| GST*2 | ECM*3 | | | | | | |
| P0171 | 0171 | FUEL SYS-LEAN-B1 | — | — | 2 | × | EC-129 |
| P0172 | 0172 | FUEL SYS-RICH-B1 | — | — | 2 | × | EC-133 |
| P0222 | 0222 | TP SEN 1/CIRC-B1 | — | — | 1 | × | EC-137 |
| P0223 | 0223 | TP SEN 1/CIRC-B1 | — | — | 1 | × | EC-137 |
| P0300 | 0300 | MULTICYL MISFIRE | — | — | 2 | × | EC-140 |
| P0301 | 0301 | CYL 1 MISFIRE | — | — | 2 | × | EC-140 |
| P0302 | 0302 | CYL 2 MISFIRE | — | — | 2 | × | EC-140 |
| P0303 | 0303 | CYL 3 MISFIRE | — | — | 2 | × | EC-140 |
| P0304 | 0304 | CYL 4 MISFIRE | — | — | 2 | × | EC-140 |
| P0327 | 0327 | KNOCK SEN/CIRC-B1 | — | — | 2 | — | EC-145 |
| P0328 | 0328 | KNOCK SEN/CIRC-B1 | — | — | 2 | — | EC-145 |
| P0335 | 0335 | CKP SEN/CIRCUIT | — | — | 2 | × | EC-147 |
| P0340 | 0340 | CMP SEN/CIRC-B1 | — | — | 2 | × | EC-151 |
| P0420 | 0420 | TW CATALYST SYS-B1 | × | × | 2 | × | EC-155 |
| P0444 | 0444 | PURG VOLUME CONT/V | — | — | 2 | × | EC-159 |
| P0500 | 0500 | VEH SPEED SEN/CIRC*4 | — | — | 2 | × | EC-161 |
| P0605 | 0605 | ECM | — | — | 1 or 2 | × or — | EC-162 |
| P0705 | 0705 | PNP SW/CIRC | — | — | 2 | × | TM-4 |
| P0710 | 0710 | ATF TEMP SEN/CIRC | — | — | 1 | × | TM-4 |
| P0715 | 0715 | INPUT SPD SEN/CIRC | — | — | 2 | × | TM-4 |
| P0720 | 0720 | VEH SPD SEN/CIR AT*4 | — | — | 2 | × | TM-4 |
| P0740 | 0740 | TCC SOLENOID/CIRC | — | — | 2 | × | TM-4 |
| P0744 | 0744 | A/T TCC S/V FNCTN | — | — | 2 | × | TM-4 |
| P0745 | 0745 | L/PRESS SOL/CIRC | — | — | 2 | × | TM-4 |
| P0746 | 0746 | PRS CNT SOL/A FCTN | — | — | 1 | × | TM-4 |
| P0776 | 0776 | PRS CNT SOL/B FCTN | — | — | 2 | × | TM-4 |
| P0778 | 0778 | PRS CNT SOL/B CIRC | — | — | 2 | × | TM-4 |
| P0840 | 0840 | TR PRS SENS/A CIRC | — | — | 2 | × | TM-4 |
| P0845 | 0845 | TR PRS SENS/B CIRC | — | — | 2 | × | TM-4 |
| P1111 | 1111 | INT/V TIM C/CIRC | — | — | 2 | × | EC-164 |
| P1121 | 1121 | ETC ACTR - B1 | — | — | 1 | × | EC-167 |
| P1122 | 1122 | ETC FUNCTION/CIRC - B1 | — | — | 1 | × | EC-169 |
| P1124 | 1124 | ETC MOT PWP | — | — | 1 | × | EC-173 |
| P1126 | 1126 | ETC MOT PWP - B1 | — | — | 1 | × | EC-173 |
| P1128 | 1128 | ETC MOT - B1 | — | — | 1 | × | EC-176 |
| P1143 | 1143 | HO2S1 (B1) | × | × | 2 | × | EC-178 |
| P1144 | 1144 | HO2S1 (B1) | × | × | 2 | × | EC-181 |
| P1146 | 1146 | HO2S2 (B1) | × | × | 2 | × | EC-184 |
| P1147 | 1147 | HO2S2 (B1) | × | × | 2 | × | EC-188 |
| P1211 | 1211 | TCS C/U FUNCTN | — | — | 2 | — | EC-192 |
| P1212 | 1212 | TCS/CIRC | — | — | 2 | — | EC-193 |
| P1217 | 1217 | ENG OVER TEMP | — | — | 1 | × | EC-194 |
| P1225 | 1225 | CTP LEARNING-B1 | — | — | 2 | — | EC-198 |

| DTC*1 | | Items | SRT code | Test value/ Test limit (GST only) | Trip | MIL | Reference page |
|---|---|---|---|---|---|---|---|
| GST*2 | ECM*3 | | | | | | |
| P1226 | 1226 | CTP LEARNING-B1 | — | — | 2 | — | EC-200 |
| P1229 | 1129 | SENSOR POWER/CIRC | — | — | 1 | × | EC-202 |
| P1564 | 1564 | ASCD SW | — | — | 1 | — | EC-204 |
| P1572 | 1572 | ASCD BRAKE SW | — | — | 1 | — | EC-207 |
| P1574 | 1574 | ASCD VHL SPD SEN | — | — | 1 | — | EC-213 |
| P1610 | 1610 | LOCK MODE | — | — | 2 | — | SEC-7 SEC-72 |
| P1611 | 1611 | ID DISCARD IMM-ECM | — | — | 2 | — | SEC-7 SEC-72 |
| P1612 | 1612 | CHAIN OF ECM-IMMU | — | — | 2 | — | SEC-7 SEC-72 |
| P1614 | 1614 | CHAIN OF IMMU-KEY | — | — | 2 | — | SEC-7 SEC-72 |
| P1615 | 1615 | DIFFERENCE OF KEY | — | — | 2 | — | SEC-7 SEC-72 |
| P1706 | 1706 | P-N POS SW/CIRCUIT | — | — | 2 | × | EC-215 |
| P1715 | 1715 | IN PULY SPEED | — | — | 2 | — | EC-217 |
| P1740 | 1740 | LU-SLCT SOL/CIRC | — | — | 2 | × | TM-4 |
| P1777 | 1777 | STEP MOTOR CIRC | — | — | 1 | × | TM-4 |
| P1778 | 1778 | STEP MOTOR FNCT | — | — | 2 | × | TM-4 |
| P1805 | 1805 | BRAKE SW/CIRCUIT | — | — | 2 | — | EC-218 |
| P2122 | 2122 | APP SEN 1/CIRC | — | — | 1 | × | EC-221 |
| P2123 | 2123 | APP SEN 1/CIRC | — | — | 1 | × | EC-221 |
| P2127 | 2127 | APP SEN 2/CIRC | — | — | 1 | × | EC-224 |
| P2128 | 2128 | APP SEN 2/CIRC | — | — | 1 | × | EC-224 |
| P2135 | 2135 | TP SENSOR-B1 | — | — | 1 | × | EC-228 |
| P2138 | 2138 | APP SENSOR | — | — | 1 | × | EC-231 |

*1: 1st trip DTC No. is the same as DTC No.

*2: This number is prescribed by ISO 15031-6.

*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

*4: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

## How to Set SRT Code

INFOID:0000000004900072

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.
The most efficient driving pattern in which SRT codes can be properly set is explained on the following figure.
The driving pattern should be performed one or more times to set all SRT codes.

### DRIVING PATTERN

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.
  Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

- Sea level
- Flat road
- Ambient air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.

Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Pattern 1:

- **The engine is started at the engine coolant temperature of –10 to 35°C (14 to 95°F) (where the voltage between the ECM terminals 38 and 44 is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminals 38 and 44 is lower than 1.4V).**

Pattern 2:

- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.

*2: Checking the vehicle speed with GST is advised.

## Test Value and Test Limit

INFOID:0000000004900073

The following is the information specified in Service $06 of ISO 15031-5.

The test value is a parameter used to determine whether a system/circuit diagnostic test is OK or NG while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

| SRT item | Self-diagnostic test item | DTC | Test value (GST display) | | Test limit |
|---|---|---|---|---|---|
| | | | TID | CID | |
| CATALYST | Three way catalyst function | P0420 | 01H | 01H | Max. |
| | | P0420 | 02H | 81H | Min. |
| HO2S | Heated oxygen sensor 1 | P0133 | 09H | 04H | Max. |
| | | P1143 | 0AH | 84H | Min. |
| | | P1144 | 0BH | 04H | Max. |
| | | P0132 | 0CH | 04H | Max. |
| | | P0134 | 0DH | 04H | Max. |
| | Heated oxygen sensor 2 | P0139 | 19H | 86H | Min. |
| | | P1147 | 1AH | 86H | Min. |
| | | P1146 | 1BH | 06H | Max. |
| | | P0138 | 1CH | 06H | Max. |
| HO2S HTR | Heated oxygen sensor 1 heater | P0135 | 29H | 08H | Max. |
| | | | 2AH | 88H | Min. |
| | Heated oxygen sensor 2 heater | P0141 | 2DH | 0AH | Max. |
| | | | 2EH | 8AH | Min. |

# SYMPTOM DIAGNOSIS

## ENGINE CONTROL SYSTEM

### Symptom Table

INFOID:0000000004900074

### SYSTEM — BASIC ENGINE CONTROL SYSTEM

| | | SYMPTOM | | | | | | | | | | | | | Reference page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Fuel | Fuel pump circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 3 | | 2 | EC-246 |
| | Fuel pressure regulator system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-287 |
| | Fuel injector circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | EC-244 |
| | Evaporative emission system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-59 |
| Air | Positive crankcase ventilation system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | 1 | | EC-255 |
| | Incorrect idle speed adjustment | | | | | | 1 | 1 | 1 | 1 | | 1 | | | EC-14 |
| | Electric throttle control actuator | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | | 2 | | 2 | EC-167, EC-169 |
| Ignition | Incorrect ignition timing adjustment | 3 | 3 | 1 | 1 | 1 | | 1 | 1 | | | 1 | | | EC-14 |
| | Ignition circuit | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | EC-249 |
| Main power supply and ground circuit | | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | | 2 | 3 | | | EC-84 |
| Mass air flow sensor circuit | | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | EC-92 |
| Engine coolant temperature sensor circuit | | | | | | | 3 | | | 3 | | | | | EC-99 |
| Heated oxygen sensor 1 circuit | | | | | 3 | | | | | | | | | | EC-105, EC-108, EC-112, EC-178, EC-181 |
| Throttle position sensor circuit | | | | | | | 2 | | | 2 | | | | | EC-102, EC-137, EC-198, EC-200, EC-228 |
| Accelerator pedal position sensor circuit | | | | 3 | 2 | 1 | | | | | | | | | EC-221, EC-224, EC-228 |
| Knock sensor circuit | | | | 2 | | | | | | | | 3 | | | EC-145 |
| Crankshaft position sensor (POS) circuit | | 2 | 2 | | | | | | | | | | | | EC-147 |

| | SYMPTOM | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | Reference page |
| Warranty symptom code | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Camshaft position sensor (PHASE) circuit | 3 | 2 | | | | | | | | | | | | EC-151 |
| Vehicle speed signal circuit | | 2 | 3 | | 3 | | | | | | 3 | | | EC-161 |
| ECM | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | EC-162 |
| Intake valve timing control solenoid valve circuit | | 3 | 2 | | 1 | 3 | 2 | 2 | 3 | | 3 | | | EC-164 |
| PNP switch circuit | | | 3 | | 3 | | 3 | 3 | | | 3 | | | EC-215 |
| Refrigerant pressure sensor circuit | | 2 | | | | 3 | | | 3 | | 4 | | | EC-256 |
| Electrical load signal circuit | | | | | | | 3 | | | | | | | EC-243 |
| Air conditioner circuit | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | 2 | HAC-4<br>HAC-123 |
| ABS actuator and electric unit (control unit) | | | 4 | | | | | | | | | | | BRC-49 |

1 - 6: The numbers refer to the order of inspection.

(continued on next table)

SYSTEM — ENGINE MECHANICAL & OTHER

| | | SYMPTOM | | | | | | | | | | | | | Reference page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Fuel | Fuel tank | 5 | | | | | | | | | | | | | FL-13, FL-15 |
| | Fuel piping | | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-157 |
| | Vapor lock | | 5 | | | | | | | | | | | | — |
| | Valve deposit | 5 | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | — |
| | Poor fuel (Heavy weight gasoline, Low octane) | | | | | | | | | | | | | | — |
| Air | Air duct | | | | | | | | | | | | | | EM-146 |
| | Air cleaner | | | | | | | | | | | | | | EM-146 |
| | Air leakage from air duct (Mass air flow sensor — electric throttle control actuator) | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | | 5 | | | EM-148 |
| | Electric throttle control actuator | | | | | | | | | | | | | | |
| | Air leakage from intake manifold/ Collector/Gasket | | | | | | | | | | | | | | |
| Cranking | Battery | 1 | 1 | 1 | | 1 | | 1 | 1 | | | | | 1 | PG-89 |
| | Generator circuit | | | | | | | | | | | | | | CHG-2 |
| | Starter circuit | 3 | | | | | | | | | | 1 | | | STR-2 |
| | Signal plate | 6 | | | | | | | | | | | | | EM-212 |
| | PNP switch | 4 | | | | | | | | | | | | | EC-215 |
| Engine | Cylinder head | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-193 |
| | Cylinder head gasket | | | | | | | | | | 4 | | 3 | | |
| | Cylinder block | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | 4 | | EM-221 |
| | Piston | | | | | | | | | | | | | | |
| | Piston ring | | | | | | | | | | | | | | |
| | Connecting rod | | | | | | | | | | | | | | |
| | Bearing | | | | | | | | | | | | | | |
| | Crankshaft | | | | | | | | | | | | | | |

| | | SYMPTOM | | | | | | | | | | | | | Reference page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | |
| Warranty symptom code | | A A | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Valve mechanism | Timing chain | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-173 |
| | Camshaft | | | | | | | | | | | | | | EM-179 |
| | Intake valve timing control | | | | | | | | | | | | | | EM-164 |
| | Intake valve | | | | | | | | | | | | 3 | | EM-193 |
| | Exhaust valve | | | | | | | | | | | | | | |
| Exhaust | Exhaust manifold/Tube/Muffler/Gasket | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-152<br>EX-9 |
| | Three way catalyst | | | | | | | | | | | | | | |
| Lubrication | Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-156<br>EM-211<br>LU-17<br>LU-19 |
| | Oil level (Low)/Filthy oil | | | | | | | | | | | | | | LU-14 |
| Cooling | Radiator/Hose/Reservoir tank cap | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | 2 | 5 | | | CO-33<br>CO-33 |
| | Thermostat | | | | | | | | | 5 | | | | | CO-42 |
| | Water control valve | | | | | | | | | | | | | | CO-45 |
| | Water pump | | | | | | | | | | | | | | CO-39 |
| | Water gallery | | | | | | | | | | | | | | CO-24<br>CO-25 |
| | Cooling fan | | | | | | | | | 5 | | | | | CO-38 |
| | Coolant level (Low)/Contaminated coolant | | | | | | | | | | | | | | CO-30 |
| NATS (Nissan Anti-Theft System) | | 1 | 1 | | | | | | | | | | | | SEC-7<br>SEC-72 |

1 - 6: The numbers refer to the order of inspection.

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# NORMAL OPERATING CONDITION

## Description

INFOID:0000000004900075

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 2,400 rpm under no load (for example, the selector lever position is neutral and engine speed is over 2,400 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will be operated until the engine speed reaches 1,500 rpm, then fuel cut will be cancelled.

**NOTE:**

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, EC-24, "System Diagram".

# PRECAUTION

## PRECAUTIONS

### Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:0000000004900076

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

**WARNING:**

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the "SRS AIR BAG".**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

### PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

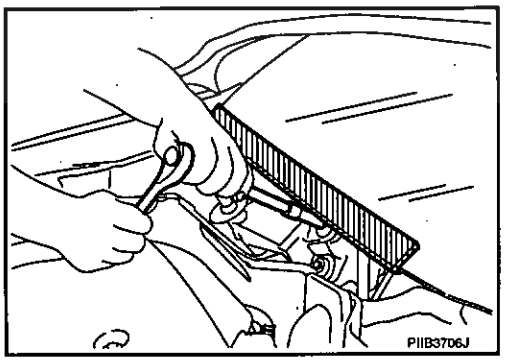
**WARNING:**

- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.**

### Precaution for Procedure without Cowl Top Cover

INFOID:0000000004900077

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc.




### On Board Diagnostic (OBD) System of Engine and CVT

INFOID:0000000004900078

The ECM has an on board diagnostic system. It will light up the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

**CAUTION:**

- **Be sure to turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-80, "Description".**

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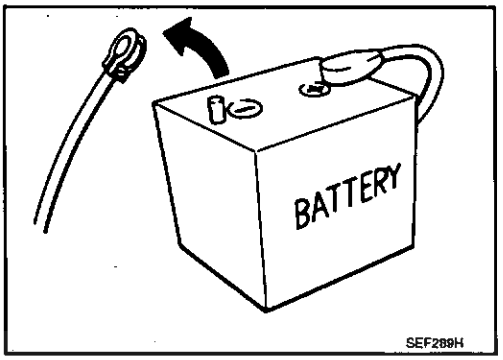
- Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to light up due to the short circuit.
- Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the fuel injection system, etc.
- Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.

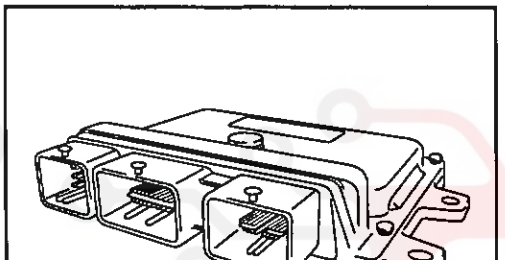
## General Precautions

INFOID:0000000004900079

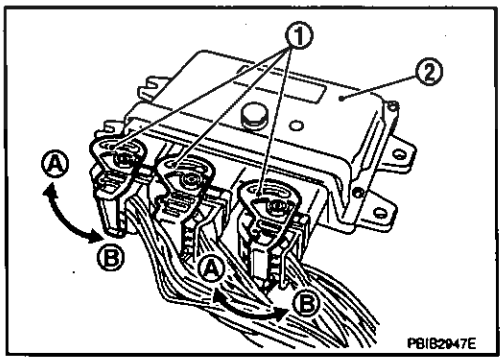
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.
- Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.



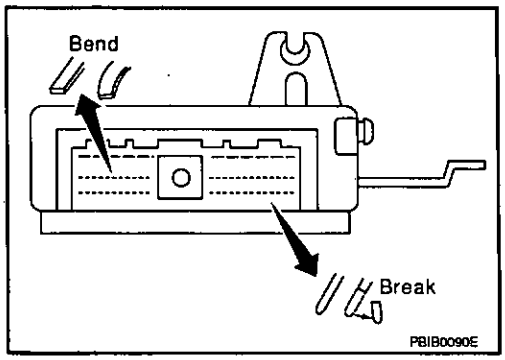

- Do not disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value.
  The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.
- If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.
  - Diagnostic trouble codes
  - 1st trip diagnostic trouble codes
  - Freeze frame data
  - System readiness test (SRT) codes
  - Test values
- When connecting ECM harness connector (1), fasten (B) it securely with a lever as far as it will go as shown in the figure.



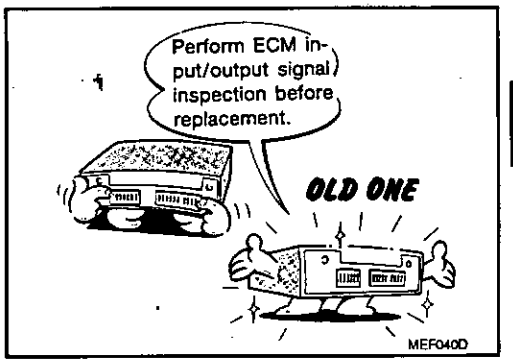

2. ECM
A. Loosen



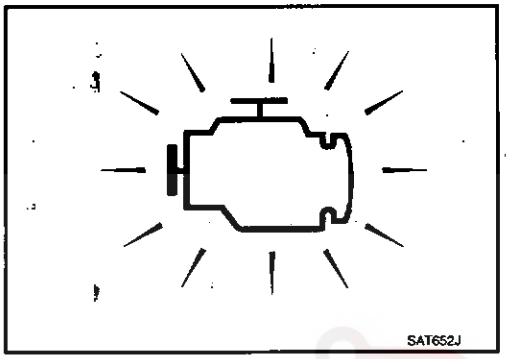

- When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Securely connect ECM harness connectors.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.



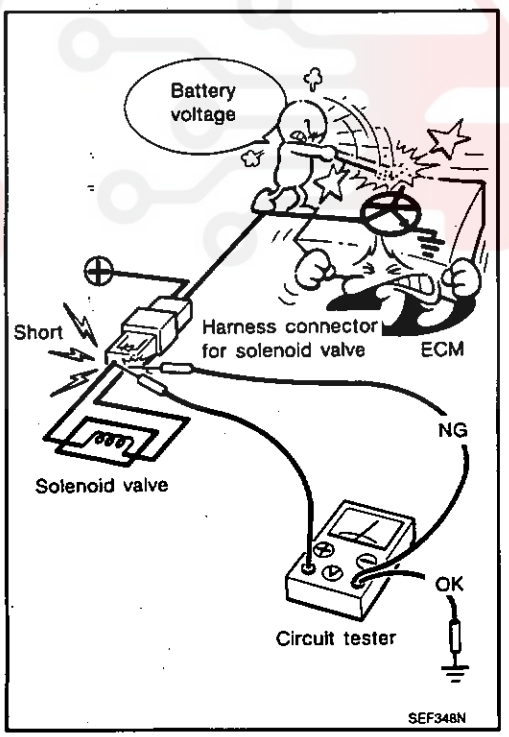
- **Keep engine control system parts and harness dry.**
- **Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-258, "Reference Value".**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious incidents.**
- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**




- **After performing each TROUBLE DIAGNOSIS, perform DTC CONFIRMATION PROCEDURE or Component Function Check.** The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.




- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  **Accidental contact of probes will cause a short circuit and damage the ECM power transistor.**




- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**

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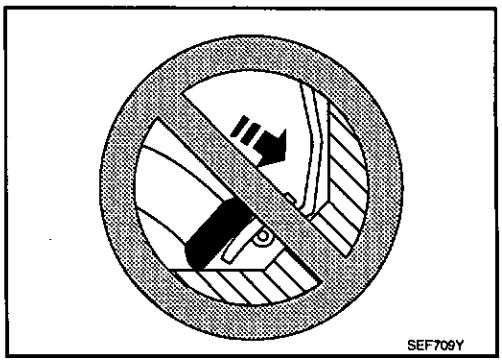
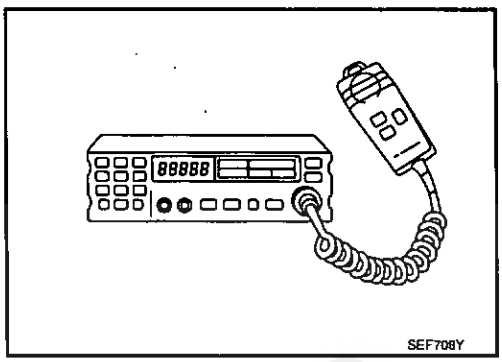
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.




- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.
  - Keep the antenna as far as possible from the electronic control units.
  - Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.
    Do not let them run parallel for a long distance.
  - Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
  - Be sure to ground the radio to vehicle body.

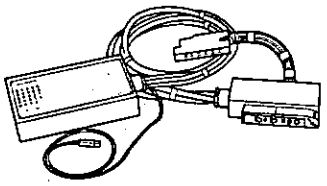
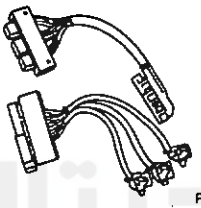
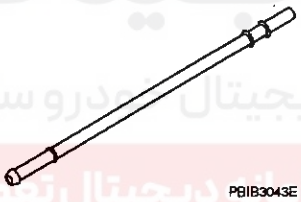


# PREPARATION

## PREPARATION

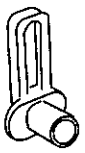
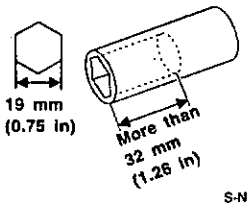
### Special Service Tools

INFOID:0000000004900080

| Tool number<br>Tool name | Description |
|---|---|
| EG17550000<br>Break-out box<br>  <br>ZZA1194D | Measuring ECM signals with a circuit tester |
| EG17680000<br>Y-cable adapter<br>  <br>PBIA9379J | Measuring ECM signals with a circuit tester |
| KV10118400<br>Fuel tube adapter<br>  <br>PBIB3043E | Measuring fuel pressure |

### Commercial Service Tools

INFOID:0000000004900081

| Tool name | Description |
|---|---|
| Quick connector release<br>  <br>PBIC0198E | Removing fuel tube quick connectors in engine room<br>(Available in SEC. 164 of PARTS CATALOG: Par No. 16441 6N210) |
| Socket wrench<br>  <br><br>S-NT705 | Removing and installing engine coolant temperature sensor |

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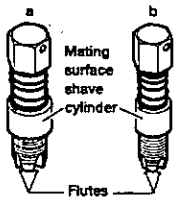
| Tool name | Description |
|---|---|
| Oxygen sensor thread cleaner   AEM488 | Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below.<br>**a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor**<br>**b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor** |
| Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)  S-NT779 | Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads. |

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# ON-VEHICLE MAINTENANCE

## FUEL PRESSURE

### Inspection

INFOID:0000000004900082

#### FUEL PRESSURE RELEASE

1. Remove fuel pump fuse located in IPDM E/R.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF.
5. Reinstall fuel pump fuse after servicing fuel system.

#### FUEL PRESSURE CHECK

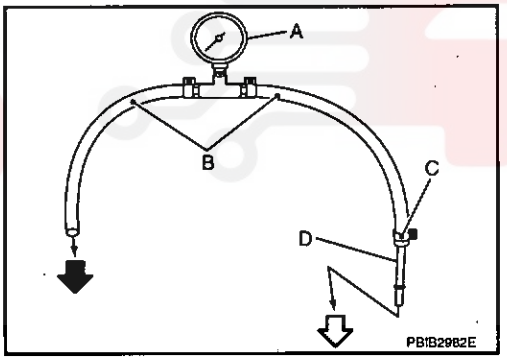
**CAUTION:**

- **Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.**
- **The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.**
- **Be careful not to scratch or put debris around connection area when servicing, so that the quick connector maintains seal ability with O-rings inside.**
- **Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C, etc.) Fuel pressure gauge may indicate false readings due to varying engine load and changes in manifold vacuum.**

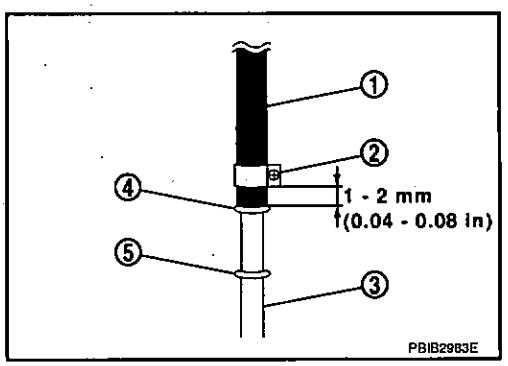
**NOTE:**

**Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because J10 models do not have fuel return system.**

1. Release fuel pressure to zero.
2. Prepare fuel hose for fuel pressure check B and fuel tube adapter [SST (KV10118400)] D, then connect fuel pressure gauge A.
   - ⇦: To quick connector
   - ⬅: To fuel tube (engine side)
   - C: Clamp
   - Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).
   - To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.
   - Do not use the fuel hose for checking fuel pressure with damage or cracks on it.
   - Use Pressure Gauge to check fuel pressure.




3. Remove fuel hose.
   - Do not twist or kink fuel hose because it is plastic hose.
4. Connect fuel hose for fuel pressure check (1) to fuel tube (engine side) with clamp (2) as shown in the figure.
   - No.2 spool (5)
   - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
   - Apply proper amount of gasoline between top of the fuel tube (3) and No.1 spool (4).
   - Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.
   - Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).
   - When reconnecting fuel line, always use new clamps.
   - Use a torque driver to tighten clamps.
   - Install hose clamp to the position within 1 - 2 mm (0.04 - 0.08 in).




**Tightening torque: 1 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb)**



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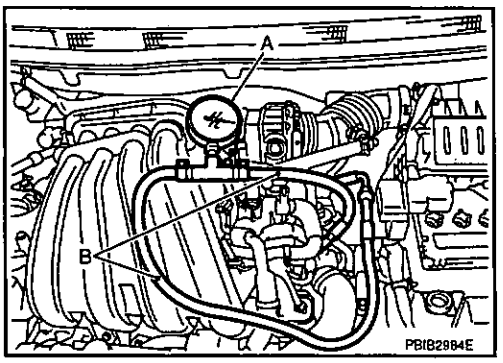
- Make sure that clamp screw does not contact adjacent parts.

5. Connect fuel tube adapter to quick connector.
   - A: Fuel pressure gauge
   - B: Fuel hose for fuel pressure check
6. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
7. Turn ignition switch ON and check for fuel leakage.
8. Start engine and check for fuel leakage.
9. Read the indication of fuel pressure gauge.
   - Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.
   - During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.




**At idling:** **Approximately 350 kPa (3.5 bar, 3.57 kg/cm$^2$, 51 psi)**

10. If result is unsatisfactory, go to next step.
11. Check the following.
    - Fuel hoses and fuel tubes for clogging
    - Fuel filter for clogging
    - Fuel pump
    - Fuel pressure regulator for clogging

    If OK, replace fuel pressure regulator.
    If NG, repair or replace.

# EVAPORATIVE EMISSION SYSTEM

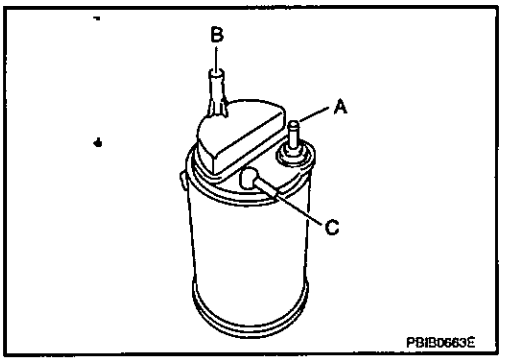
## Inspection

INFOID:0000000004900083

1. Visually inspect EVAP vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Check EVAP canister as follows:

a. Block port (B). Orally blow air through port (A). Check that air flows freely through port (C).

b. Block port (A). Orally blow air through port (B). Check that air flows freely through port (C).

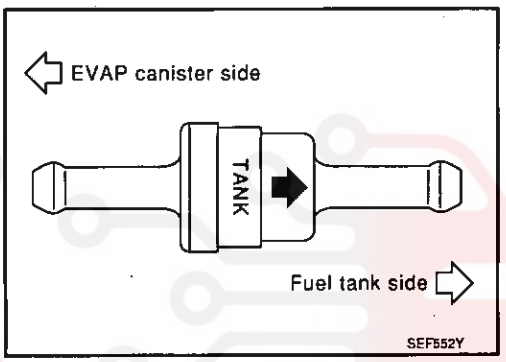



3. Visually inspect the fuel check valve for cracks, damage, loose connections chafing and deterioration.
4. Check fuel check valve as follows:

a. Blow air through connector on the fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.

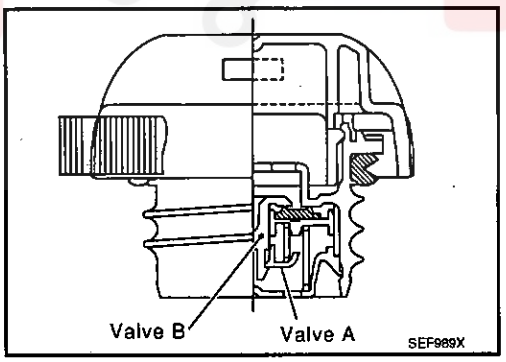
b. Blow air through connector on EVAP canister side. Air flow should be smoothly directed toward fuel tank side.

c. If fuel check valve is suspected or not properly functioning in step 1 and 2 above, replace it.




5. Inspect fuel tank filler cap vacuum relief valve for clogging, sticking, etc.

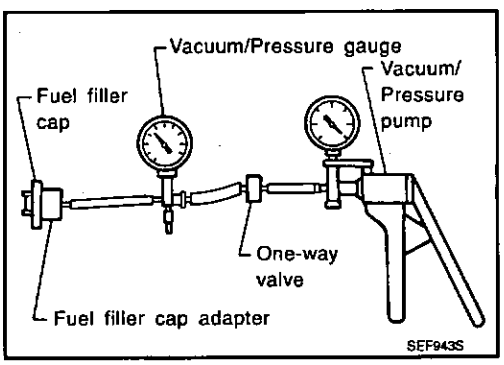
a. Wipe clean valve housing.




b. Check valve opening pressure and vacuum.

| | |
|---|---|
| Pressure: | 15.3 - 20.0 kPa (0.153 - 0.200 bar, 0.156 - 0.204 kg/cm$^2$, 2.22 - 2.90 psi) |
| Vacuum: | −6.0 to −3.4 kPa (−0.06 bar to −0.034bar, −0.061 to −0.035 kg/cm$^2$, −0.87 to −0.49 psi) |

c. If out of specification, replace fuel filler cap as an assembly.



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# SERVICE DATA AND SPECIFICATIONS (SDS)

## SERVICE DATA AND SPECIFICATIONS (SDS)

### Idle Speed

INFOID:0000000004900084

| Transmission | Condition | Specification |
|---|---|---|
| CVT | No load* (in P or N position) | 700 ± 50 rpm |
| M/T | No load* (in Neutral position) | 700 ± 50 rpm |

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

### Ignition Timing

INFOID:0000000004900085

| Transmission | Condition | Specification |
|---|---|---|
| CVT | No load* (in P or N position) | 9 ± 5° BTDC |
| M/T | No load* (in Neutral position) | 9 ± 5° BTDC |

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

### Calculated Load Value

INFOID:0000000004900086

| Condition | Specification (Using GST) |
|---|---|
| At idle | 10 – 35 % |
| At 2,500 rpm | 10 – 35 % |

### Mass Air Flow Sensor

INFOID:0000000004900087

| | |
|---|---|
| Supply voltage | Battery voltage (11 – 14 V) |
| Output voltage at idle | 0.9 – 1.1V* |
| Mass air flow (Using GST) | 1.0 – 4.0 g·m/sec at idle*<br>2.0 – 10.0 g·m/sec at 2,500 rpm* |

*: Engine is warmed up to normal operating temperature and running under no load.